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SOCIETY OF SCOTLAND

WITH
AN ABSTRACT OF THE PROCEEDINGS AT BOARD AND GENERAL
MEETINGS, AND THE PREMIUMS OFFERED BY
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WELLWOOD H. MAXWELL, ESQ. OF MUNCHES.

*From Portrait by Sir George Reid presented to Mr Maxwell by the Government
from the position of Commander of the Staff of Kitchener at Khartoum
for forty years.*

TRANSACTIONS
OF
THE HIGHLAND AND AGRICULTURAL
SOCIETY OF SCOTLAND

- - -

REMINISCENCES OF EIGHT HIGHLAND SHOWS
AT DUMFRIES, 1830-1895.

By WELLWOOD H. MAXWELL of Munches.

THE meetings of agricultural societies in most country districts are a great source of interest, it may be said, to all classes of the community, and more especially to the agricultural labourers, who have few other opportunities of meeting with friends or of seeing the changes which are now constantly taking place both amongst live stock and implements. If for no other reason than this, these meetings deserve every encouragement.

Under different forms and various constitutions agricultural societies have existed in the British Isles for more than a century. Scotland took the lead in 1784, when it founded the Highland Society, which, as the National Agricultural Society of Scotland, has for many years held a prominent position amongst the similar societies in this and other countries. The annual Shows of our National Society, held in the various divisions of Scotland, are looked forward to with the keenest interest—an interest which happily would seem to go on increasing as years go by.

The Highland Show of 1895 fell by rotation to be held at Dumfries, the beautifully situated "Queen of the South," or the
VOL. VIII. A

capital of the south-west of Scotland, as it is sometimes called. The Dumfries Show district comprises the county of Dumfries, the stewartry of Kirkcudbright, and the county of Wigtown. These counties, as well as the town of Dumfries, are expected to contribute towards the funds of the Show, and thus they have always done, as liberally, it is believed, as any other part of Scotland.

The first Highland Show at Dumfries was held in 1830, and since then seven have been held in this centre. The writer has been spared to be present at all these eight Shows, and at most of them assisted in the local arrangements.¹ The object of these remarks will be to take note in a very general way of some of the many changes which since 1830 have occurred, not merely in the Highland Shows themselves, but also in agricultural customs.

Galloway Agriculture in Bygone Days.

It is interesting to look back upon the condition of agriculture in this district a century ago, and to contrast it with what we see around us to-day. In a report published in pamphlet form by a society which existed in Castle-Douglas for a few years about 1809 a writer says: "It is not to be dissembled that we live in a remote part of the country, that we are far from the most cultivated districts of the kingdom, that our prejudices are deep-rooted, while an improved system of husbandry is little known. This province dates the decline of its husbandry from the wars between Bruce and Baliol; before it was wasted by them it was highly cultivated and supplied the English armies with grain."

This suggestive glimpse of the agriculture of Galloway and Dumfriesshire in bygone days is supplemented by an interesting letter, written in 1811, by my great-grandfather, "Maxwell's veteran chief" of Robbie Burns. Having for a time held the position of chamberlain to the Duke of Buccleuch at Drumlanrig, and having been largely consulted on agricultural matters, he had exceptional opportunities of becoming acquainted with the condition of the country. The letter referred to was written at the request of Mr Herries of Spottes (a leading landed proprietor who took much interest in agricultural affairs) for the information of Mr Curwen, a Cumberland gentleman, who was making an agricultural tour through Galloway in the year

¹ Mr Maxwell was a member of the Local Committee for all the Dumfries Shows since 1845 inclusive, and filled the office of Convener of the Local Committee for the Shows of 1870, 1878, 1886, and 1895. *En.*

1811. It was written when its author was in his ninety-second year, and runs as follows:—

MUNCHEE, Feb. 8, 1811.

DEAR SIR,— I was born at Buittle, in this parish (which in old times was the fortress and residence of John Balliol), on the 7th day of February, old style, 1720, and do distinctly remember several circumstances that happened in the years 1723 and 1724. Of these particulars, the falling of the bridge of Buittle, which was built by John Frow in 1722, and fell in the succeeding summer while I was in Buittle garden seeing my father's servants gathering nettles. That same year many of the proprietors inclosed their grounds to stock them with black cattle, and by that means turned out a vast number of tenants at the term of Whitsunday 1723, whereby numbers of them became destitute, and in consequence rose in a mob, when with pitchforks, gavellocks, and spades they levelled the park-dikes of Barncaillzie and Munches, at Dalbeaty, which I saw with my own eyes. The mob passed by Dalbeaty and Buittle, and did the same on the estates of Netherlaw, Dunrod, &c., and the laird of Murdoch, then proprietor of Kilwhaneday, who turned out sixteen families at that term. The proprietors rose, with their servants and dependents, to quell this mob, but were not of sufficient force to do it, and were obliged to send for two troops of dragoons from Edinburgh, upon the appearance of whom the mob dispersed. After that warrants were granted for apprehending many of the tenants and persons concerned in the said mob. Several of them were tried: those who had any funds were fined, some were banished to the Plantations, whilst others were imprisoned, and it brought great distress upon this part of the country. At that period justice was not very properly administered, for a respectable man of the name of M'Clacherty, who lived in Balmaghie parish, was concerned in the mob, and on his being brought to trial, one of the justices admired a handsome Galloway which he rode, and the justice told him if he would give him the Galloway he would effect his acquittal, which he accordingly did. This misfortune, with what happened the Mississippi Company in the year 1720, did most generally distress this quarter of the kingdom. It is not pleasant to represent the wretched state of individuals as times then went in Scotland. The tenants in general lived very meanly on kail, groats, milk, gradlon ground in querns turned by the hand, and the grain dried in a pot, together with a crack owe now and then about Martinmas. They were clothed very plainly, and their habitations were most uncomfortable. Their general wear was of cloth made of waulked plaiding, black and white wool mixed, very coarse, and the cloth rarely dyed. Their hose were made of white plaiding cloth sewed together, with single-soled shoes, and a black or blue bonnet, none having hats but the lairds, who thought themselves very well dressed for going to church on Sunday with a black kilt-coat of their wife's making. It is not proper for me here to narrate the distresses and poverty that were felt in the country during those times, which continued till about the year 1725. In 1725 potatoes were first introduced into this stewartry by William Hyland, from Ireland, who carried them on horses' backs to Edinburgh, where he sold them by pounds and ounces. During those times, when potatoes were not generally raised in the country, there was for the most part a great scarcity of food, bordering on famine; for in the stewartry of Kirkcudbright and county of Dumfries there was not as much victual produced as was necessary for supplying the inhabitants, and the chief part of what was required for that purpose was brought from the Sandheads of Esk, in tumbling cars, on the Wednesdays, to Dumfries; and when the waters were high by reason of spates, and there being no bridges, so that these cars could not come with the meal, I have seen the tradesmen's wives in the streets of Dumfries crying because there was none to be got. At that

period there was only one baker in Dumfries, and he made bawbee baps of coarse flour, chiefly bran, which he occasionally carried in creels to the fairs of Urr and Kirkpatrick. The produce of the country in general was grey corn, and you might have travelled from Dumfries to Kirkcudbright, which is twenty-seven miles, without seeing any other grain except in a gentleman's croft, which in general produced bear or big for one-third part, another third in white oats, and the remaining third in grey oats. At that period there was no wheat raised in the country; what was used was brought from Teviot; and it was believed that the soil would not produce wheat. In the year 1735 there was no mill in the country for grinding that sort of grain; and the first flour-mill that was constructed within these bounds was built by old Heron at Clouden, in the parish of Irongray, some years after that date.

In these times cattle were also very low. I remember of being present at the Bridge end of Dumfries in 1738 when Anthony M'Kie of Netherlaw sold five score of five-years-old Galloway cattle, in good condition, to an Englishman at £2, 12s. 6d. each; and old Robert Halliday, who was tenant of a great part of the Preston estate, told me that he reckoned he could graze his cattle on his farm for 2s. 6d. a-head; that is to say, that his rent corresponded to that sum.

At this period few of the proprietors gave themselves any concern about the articles of husbandry, their chief one being about black cattle. William Craik, Esq. of Arbigland's father died in 1735, and his son was a man of uncommon accomplishments, who in his younger days employed his time in grazing of cattle and studying the shapes of the best kinds, his father having given him the farm of Maxwelltowne to live upon. The estate of Arbigland was then in its natural state, very much covered with whins and broom, and yielding little rent, being only about 3000 merks a-year.¹ That young gentleman was among the first that undertook to improve the soil; and the practice of husbandry which he pursued, together with the care and trouble he took in ameliorating his farm, was very great. Some of it he brought to such perfection, by clearing of all weeds and stones and pulverised it so completely, that I, on walking over the surface, sunk as if I had trodden on new-fallen snow.

The estate of Arbigland was bought by his grandfather in 1722 from the Earl of Southesk for 22,000 merks.

In 1739 there were only two carts for hire in the town of Dumfries, and one belonging to a private gentleman.

About the year 1737 and 1738 there was almost no lime used for building in Dumfries, except a little shell-lime, made of cockle-shells, burned at Colvend, and brought to Dumfries in bags a distance of twenty miles; and in 1740, when Provost Bell built his house, the under storey was built with clay, and the upper storeys with lime brought from Whitehaven in dry-ware casks. There was then no lime used for improving the land. In 1749 I had day-labourers at 6d. per day, and the best masons at 1s. This was at the building of Mollance House, the walls of which cost £49 sterling.

If you think that anything mentioned here can be of any use or entertainment to Mr Curwen, I give you full leave to make the same known, with bests respects.—And I am, dear sir, yours sincerely,

JOHN MAXWELL.

To W. M. HERRIES, Esq. of Spottes.

I have in my possession a copy of a work, published in 1810, by the Rev. Samuel Smith, minister of Borgue, on the Agriculture of Galloway. It was drawn up for the consideration of

¹ 18 merks make £1 sterling, or £12 Scots.

the Board of Agriculture, and is considered the best and most reliable account of the condition of agriculture in Galloway at that time. In this work reference is made to an attempt early in the eighteenth century to restrict tillage to from one-half to one-fourth of the arable land, no doubt with the object of preventing over-cropping with grain. An insurrection followed, and it is remarked that after its suppression a number of people left the country, and "since then grazing has been the favourite object with the farmers and landholders."

Mr Smith mentions that about 1730 marl was discovered and applied as manure with astonishing results. Continuous cropping became more persistent than ever, and in the end land-owners began to impose restrictions debarring tenants from taking more than three successive crops of grain after manuring with marl, and from breaking up pasture-lands till they had lain six years in grass. The use of marl was followed by that of sea-shells, and afterwards by the use of lime from Cumberland.

It is remarked by Mr Smith that more cattle are bred on many farms than they are able to keep till they are fit for the English market, which leads farmers to become dealers in cattle and to attend markets whether they have business or not, with the result that the work at home is neglected, and other ills follow.

Oats were then, as they are still, the chief grain crop, the district not being considered suitable for wheat. Wheat was, however, grown to some extent on the good lands, and yielded about 34 bushels per acre.

At that time, 1810, there was much talk about the introduction of turnip culture. Turnips were grown in many districts, but only to a very limited extent. Much discussion was taking place as to whether potatoes or turnips were the more profitable crop. Three varieties of turnips are mentioned as generally sown — White Globe, Red Top, and Ruta Bega or Swede. Yellow turnips were not often seen in the district. Difficulties arose as to how the turnip crop could be consumed. At that time the folding of sheep on roots had scarcely begun. Potatoes were grown very extensively and successfully. About one-twelfth of the tillage-land was usually under potatoes.

It is remarked that flax was not raised in sufficient quantity for the linen manufactured in the families of the farmers and cottagers, and was not nearly adequate to the wants of the whole inhabitants. Fifty years ago a small plot of flax was grown on almost every farm, the flax being spun by the women of the district and woven into cloth at the handlooms which existed in large numbers. Unfortunately this practice has now altogether disappeared.

Mr Smith mentions that the kinds of grasses almost exclu-

sively grown were red clover and ryegrass, with occasionally a little white clover, the last named coming up spontaneously in most lands laid out in good condition.

Calcareous manures—marl, sea-shells, and lime—were the only artificial manures used. They were applied to a considerable extent; and it is mentioned that some industrious farmers covered the bottom of their cattle-yards with peat-earth.

The breeding and rearing of Galloway cattle were great objects then with Galloway farmers. The cattle are described as “almost universally polled,” and as rather under medium size—less than the horned breeds of Lancashire, but larger than the North or West Highlanders. Little was done then in dairying, in fattening cattle for the butcher, or in breeding or rearing sheep. The average prices of Galloway cattle on good farms in the low country at that time (1810) are given at £4, 10s. for yearlings, £8 for two-year-olds, £12, 12s. for three-year-olds. Cattle three and a half years old were expected to weigh about 36 stones of 16 lb., and be worth about £14, 14s. About 20,000 cattle were then sent yearly from Galloway to Norfolk to be fattened for the London market.

It is mentioned that Ayrshire cows were then being introduced from Kyle. The value of their produce for the year on good pastures was estimated at £8 per cow. From 1200 to 1400 stones of cheese were made from the milk of sixty cows.

The Blackfaced breed of sheep was considered better than any other breed for the district. The small Leicester was introduced with some success, and Cheviots were esteemed for their wool. The average price of Blackfaced sheep at two years old was about £15 per score, and of Cheviots £21. Blackfaced wool was worth 10s. per stone of 28 lb., and Cheviot wool 20s. Three-year-old wedders, reared on coarse grass-lands, and weighing from 36 to 50 lb., sold for from 14s. to 21s.

The farm-horses are spoken of as being hardy and active, and as having descended from Spanish horses which escaped from a vessel of the Armada wrecked on the shores of Galloway. It is stated that the still older race of Galloway horses were giving place to these horses of greater weight and strength, animals better adapted for farm-work. The price of horses is quoted as ranging from £15 to £50 for animals from 14 to 16 hands high.

The price of labour was not high at the beginning of the century. Mr Smith tells us that women were hired by the half-year at from £2, 10s. to £4, and men at from £14 to £20 a-year. Ploughmen were paid partly in money and partly by what is called “benefit”—equal to about £30 a-year. For the grain harvest women got from 40s. to 45s., and men from 50s. to 55s., with food three times a-day. Reapers engaged by the

day got from 1s. 8d. to 2s. per day. It was computed that four hands should cut an acre of corn in a day.

The following extract from an old publication has only a very slight connection with the agriculture of Galloway in bygone days, yet it will doubtless be read with some interest :—

Date 1774.

The Town Council of Wigtown, taking into consideration the pernicious and fatal consequences attending the so common practice of Smuggling all kinds of protected and accustomed goods, particularly Brandy and Tea, from the Isle of Man, whereby the lawful and fair trader is discouraged, . . . the revenues much lessened, and the morals of numbers of people debauched and our country drained of its coin, which would be more naturally employed in manufacturing our own wool than to be carried over to the Isle of Man, whence it is directly transferred to France to strengthen the hands of our declared enemies ; therefore unanimously resolve that they will not drink French Brandy ; they will discourage the growing practice of Smuggling and Tea-drinking ; which intimation they appoint to be intimated through the town by Tuck and Drum.

Early Work of the Society.

In the foregoing notes we have an indication of the condition of agricultural affairs in Galloway and Dumfriesshire just about the time the Highland Society began its active and useful career. Those intrusted with the management of the Society soon saw the necessity of doing something for the improvement of agriculture. The Society made a beginning by giving premiums to different districts for whatever branch of farming seemed most in need of attention. Premiums for reports on the cultivation of turnips were given by the Society in 1795 in other parts of the country, but it was not until 1814 that any premiums came into this district.

Improved tillage first received the attention of the Society. In 1801 the Society resolved to offer prizes for ploughing ; and it is interesting to note that the first three ploughing matches held under the auspices of the Society took place in the Dumfries Show district—the first on the estate of Hoddam, in Annandale, on 7th November 1801 ; the second at Luce Holm, near Ecclefechan, on the 1st November 1802 ; and the third on 8th November 1802 at Blackpark, near Castle-Douglas. At some of these early ploughing competitions, notably near Kirkcudbright, ploughs were drawn by oxen—a practice which long, long ago disappeared from this part of the country. Since 1818 only medals have been given by the Society, other premiums being provided by local societies, which began at a very early date to take an interest in ploughing competitions—an interest that would seem to be well maintained to the present day.

One of the first great objects which the Highland Society set itself to accomplish was the founding of local societies for the advancement of agriculture. Under its fostering care numerous local societies were started throughout the country, several of these societies beginning operations very early in the present century. Few of the original societies now exist; but their good work has been taken up and carried on by other societies, most probably of wider organisation.

Fifty years ago there were about five Agricultural Societies in the counties of Dumfries, Kirkcudbright, and Wigtown. Now there are about eleven. The rules which regulated the working of some of these earlier societies read somewhat curiously in the light of the present day. In the regulations of a Wigtownshire society in 1844 it was provided that at the annual general meeting of the society the members shall dine together, "the expense for both dinner and drink not to exceed 4s. each person, and if the preses allow more expense to be incurred he shall pay for it out of his own pocket." The "general objects" of that society, as expressed in its regulations, have a thoroughly practical and intelligent ring about them. They run as follows—viz.: "To improve the land under grass and tillage; to improve the breed of every kind of farm stock; to diffuse useful information on agricultural subjects; to improve the cottages and domestic comforts of agricultural labourers; and to cherish by friendly competition and occasional meetings the spirit of kindness and good neighbourhood among all classes and ranks in the district."

Show of 1830.

The Highland Society held its first Show—at Edinburgh—in 1822, and, as we have seen, paid its first visit to Dumfries in 1830. That first Highland Show there, held under the management of Sir Charles Gordon, the then Secretary, was considered a success. It of course contrasts curiously with the Shows that followed. These early Shows at Dumfries were held about the beginning of October, the time of the year when Galloway cattle, the great breed of the district, were seen to best advantage, and when large droves of Galloways, numbering some 4000 or 5000 head, were to be seen passing through Dumfries on their way to the southern markets.

The Show of 1830 was held in the grounds of the Dumfries Academy, and lasted only one day. It was provided by the rules that the stock exhibited must have been the property and in the possession of the competitor from the 1st January 1830, and fed solely on the farm produce, certain classes of breeding and extra stock being exempted from these conditions.

In the premium list I find prizes for "the best two spayed heifers." It was the universal practice in this part of the country long after that day to "spay" heifers not intended for breeding. The operation was performed by men who took it up as a business, and were known as "spayers." There is not a little to be said in favour of the practice.

As would be expected, the whole of the members of the Society's Committee and of the Committee of the district have passed away, not one of them remaining to tell the tale. That model landlord and greatly respected man, Mr Hope-Johnstone of Annandale, was convener of the Local Committee. He carried off several premiums for Galloways, but the majority of the prizes went to the neighbourhood of Kirkcudbright. I notice with curiosity that in the list of the local prize-winners in 1895, there are no descendants of those who took prizes in 1830.

There were only 17 Ayrshires shown in 1830; the prize for the best bull going into Lanarkshire. Of Shorthorns only one was exhibited, a fact commented on and regretted at the time. Of sheep there was a good entry, numbering 247; of horses 62; and implements 18. There were no exhibits of dairy produce. Small as the entries were in most classes, they contrasted favourably with those at all the previous Shows of the Society, excepting the Shows held at Glasgow in 1826 and 1828.

At this Show Mr Menteath of Closeburn exhibited in harness a bull which was described as of a beautiful colour and prodigious strength. The bull drew a waggon with upwards of two tons of coals from Closeburn, a distance of about twelve miles. In crossing from the road into the Show-ground the axle-tree of the waggon broke and stopped the wheels, yet the animal with the greatest ease proceeded with its load up an ascent of one-in-eight, notwithstanding the fact that the ground was wet and badly cut. The load, in the circumstances, was estimated at not less than four tons. Mr Menteath owned and worked coal-mines in Ayrshire, and it is presumed that this bull had been one of the beasts of burden employed by him in carting coals. It is uncertain as to what breed the bull belonged.

The value of the premiums amounted to £353, and was contributed to in a very liberal manner by the town of Dumfries, the three counties, and the Kirkcudbright, Nithsdale, and Annandale Agricultural Societies. The gate-money, amounting to £163, was more than at any former Highland Show excepting at Glasgow.

The proceedings of the day, which passed off satisfactorily, were brought to a close by a dinner, a practice which was universally followed for many years thereafter. The dinner of 1830 was presided over by the late Duke of Buccleuch, then

quite a young man. His Grace was ably supported by Sir James Graham and other leading agriculturists of the district. Above 400 sat down to dinner.

Show of 1837.

The success of the first Show made the agriculturists of the districts desirous of having another visit from the Society. To obtain this efforts were begun as early as 1834, and chiefly at the instigation of my father, who had been a Director of the Society, a movement was set on foot which resulted in the district guaranteeing a sum of £500, on the Society agreeing to hold the Show of 1837 at Dumfries. I have before me a copy of a memorial submitted to the Directors of the Society, craving for this second visit. It is dated "Dumfries, 22d October 1834," and runs as follows:—

To the Honourable the DIRECTORS of the Highland and Agricultural Society of Scotland.

We, the Noblemen and Gentlemen connected with the South of Scotland, herewith subscribing, being well convinced of the beneficial consequences which have resulted from the plan of holding a great annual Show of Live Stock and exhibition of Implements, Roots, and Seeds, and of the importance which the General Show at Dumfries in 1830 was to that district of country, do now again crave the Honourable the Directors to fix an early period for another General Show to be held at Dumfries, not doubting that the counties therewith connected will come forward with subscriptions in aid of the Premiums to be offered by the Society.

The memorial is signed by twenty noblemen and gentlemen, headed by the Duke of Buccleuch, and including the Earl of Selkirk and the Earl of Galloway. I also have at my hand a copy of a letter which my father addressed to the Secretary of the Society in forwarding the above memorial. In that letter he says: "The signatures might have been much more numerous, but this was considered unnecessary. The feeling in favour of a continuation of these Shows seems universal amongst all classes."

The amount offered in prizes in 1837 was £650. The drawings at the gates rose to £382—again surpassing all former Shows, excepting that at Glasgow in 1828, and only £18 below the drawings there. The entries of cattle had only increased by one as compared with 1830, but more Shorthorns were exhibited. Both horses and sheep reached larger numbers; and for the first time in this district dairy produce appeared in the prize-list, thirty-one exhibits being entered in that section.

The Show was held in a field now built on adjoining the Dumfries Butter-Market. Mr Hope-Johnstone was Convener of the Local Committee, with my father as a deputy or assist-

ant, the former being prevented by his parliamentary duties from attending to the preparatory business of the Show.

In those days more work fell upon the Local Committee than is the case now. The Committee for the Show of 1837 were fortunate in having as Local Secretary Mr Threshie, County Clerk of Dumfriesshire, a very efficient man of business.

For the dinner on this occasion a temporary hall was erected, capable of accommodating 1200 people,—the cost of erecting the hall being met by subscriptions raised in the district. The hall was completely filled, and the dinner was a great success. There were no fewer than thirty-six toasts on the list, ending with “The Land o’ Cakes, and good roads to ready markets”—quite the usual toasts of those days.

The special feature of the Show of 1837 was the steam-plough, invented by Mr Heathcote, M.P., which was brought to the Show by the Local Committee, and was exhibited at work on the Lochar Moss, about four miles south of Dumfries. The plough was not considered a great success, but it is believed to be the first instance of steam-power being applied to the cultivation of the soil in Scotland. And I may remark in passing that it was in the county of Dumfries where steam was first used in propelling a boat—on the small loch at Dalswinton in 1788.

To defray the expenses of bringing the steam-plough to the district, as well as the cost of erecting the hall for the dinner, a subscription was raised in the district; and a list in my hands shows that a sum of £319, 11s. was obtained for these purposes—this in addition to the sum contributed to the Society in aid of the fund for premiums.

At the close of the Show some of the live stock were sold by public roup.

Premiums were offered for wool in 1837, but the wool was exhibited in Edinburgh.

It was provided at that Show that the animals must have been at least one year in the possession of the exhibitor prior to the Show; and in the case of fat stock particulars had to be given as to the method of feeding.

The classes of dairy produce were confined to the Show district. Prizes were offered for “Sweet or Full-milk Cheese, any variety most profitable for the market”; and also for “Skimmed-milk Cheese.” Nine competitors entered for the prizes for “Cured Butter.”

• Show of 1845.

The Show of 1845 deserves some special notice. That very efficient Secretary Sir Charles Gordon died a few weeks before

the Show, and the duties of the position were discharged by his chief clerk, Mr Stoddart Macdonald, who had been over twenty years in the Society's office, and who acted as Interim Secretary till the appointment of Mr Hall Maxwell in January 1846. The Show was held so late in the year as the 7th October, and continued over three days. The site was on a level field by the side of the river Nith, known as the Dock Park.

The exhibits of live stock continued to increase in numbers. Poultry were included for the first time in this district, as were also coaching stallions, of which latter eight were entered.

The Convener of the Local Committee was Mr Leny of Dalswinton; and of the members of that Committee only Colonel Malcolm of Burnfoot and myself survive. A glance through the list of prize-winners would seem to show that the only survivor amongst the local winners is Mr Thomas Biggar, then in King's Grange, now proprietor of Chapelton, Dalbeattie. Mr Biggar was awarded medals for "perennial ryegrass-seed" and for "a new variety of grass-seed." In later times, in conjunction with his sons, James and William, Mr Thomas Biggar has been a frequent prize-winner at Highland Shows, chiefly for Galloway cattle. And it is interesting to note that exactly half a century after his first Highland Show victories in 1845, he showed again, at Dumfries last July, taking a creditable position in the list of winners. Few men have stood higher amongst the agriculturists of the district, or have done more to promote agricultural prosperity, than Mr Thomas Biggar. Although now over fourscore, he still enjoys wonderful health and vigour.

At the dinner in connection with this Show, the Duke of Montrose presided over a company numbering about a thousand. The ticket cost 10s., and included "a pint of wine and a bottle of cold punch." Many toasts of practical interest were proposed and duly honoured; and amongst others was a toast to the Royal Agricultural Society of England, which had been founded a few years previously. Mr Neilson of Halewood, a Lancashire merchant and agriculturist, was coupled with this latter toast, and in responding referred to some features which had struck him in passing through the district, notably the management of the farmyard manure, which he did not consider satisfactory. He spoke of the advantage of hearty co-operation between landlord and tenant—the former performing the permanent improvements, and the latter acting up to the motto "Plough deep, muck heavy, and weed clean." With this active co-operation between the owner and occupier of the land ample employment would be given to the labourer, and the necessity for emigration would be superseded, while the country might be independent of foreign countries for the staff of life. The price of wheat at that time was 48s. per quarter—rather a contrast to the present figure!

Representatives were also present at the dinner from the Irish and French Agricultural Societies, and these were likewise duly honoured in the toast-list.

On each morning of the Show there were largely attended breakfast meetings at which agricultural subjects were discussed. Two of these meetings were presided over by the Duke of Buccleuch, and the other by Sir William Jardine, Bart. of Applegarth. Amongst the subjects discussed were "Furrow Draining" and "The Feeding and Rearing of Live Stock." The principal speakers were Professor Johnston, the famous agricultural chemist; Mr Elliot, Hardgrave; Mr Stewart, Hillside, factor on the Annandale property; Mr Tennant, Howell; Mr Gillespie, Annanbank; Mr Caird, Baldoon; Mr Smith, Deanston; Mr Johnstone, Alton; Mr Dudgeon, Spylaw; and Mr Aitchinson, Dromore. The Society had not a Chemical Department of its own then; but Professor Johnston was chemist to the Chemistry Association, which was some time afterwards merged into the Highland and Agricultural Society.

Show of 1860.

The Show of 1845 was in many senses highly successful—successful from an exhibitor's point of view, successful in attendance with but little railway communication, and successful on account of the highly interesting addresses that were delivered by leading agriculturists of the time. After that meeting there was a long blank, for the next Highland Show at Dumfries was held in 1860.

The long delay in returning to Dumfries with the Highland Show after 1845 was due to the fact that the annual Show was found to be too heavy a drain upon the Society's funds. Between 1822 and 1848 the Society had lost about £5000 upon its annual Show, and on this account the Show was held only every second year from 1848 to 1856.

The Dumfries Show of 1860 was held in the month of July on a site by the side of the Castle Douglas railway on College Mains in the Stewartry. It was not a very suitable situation, yet the results were fairly satisfactory. The premiums had been increased from £900 to £1500, and the gate-money rose from £440 in 1845 to £1275.

In the exhibits of live stock there was a large increase, and those of dairy produce were doubled. The prizes for Galloway cattle went largely into the same hands as before. With Shorthorns and Ayrshires strangers were generally most successful. The exhibits of horses, mostly Clydesdales, were considered disappointing; the great attention since devoted to horse-breeding in the district had scarcely begun then.

As to the dairy produce, it was reported to have been excellent and the display large. In bygone times the district had been noted for the inferior character of its dairy produce. Indeed amongst the merchants of Edinburgh and Glasgow, it was customary to say of any cheese of inferior quality that it had a "Sanquhar flavour." That reproach was completely wiped away by the high standard of excellence in the display of 1860.

The dinner in connection with the Show was held in the Implement Shed at the railway station, which was transformed into a spacious banqueting-hall for the occasion. Mr Douglas, Athelstaneford, replied to the toast of the successful exhibitors, and stated that he had refused an offer of 800 guineas for two of his Shorthorns exhibited in the Show.

By the way, it was about this time that a Frenchman, M. Dutrone, who had been visiting shows in Scotland, was so enamoured of what he described as the fine black harmless bulls with no horns (Galloways), that for years he gave medals for the best of these bulls at the Highland Show. In 1860 Mr Beattie, Newbie, got the medal for the best "harmless bull." The idea that a Galloway bull because hornless is also harmless is perhaps open to question!

The only other striking incident in the Show of 1860 which need be mentioned is a lecture by Rarey, a famous horse-tamer, on his method of subduing horses.

Show of 1870.

The Show of this year was held again in July on a more convenient site, on the farm of Rotchell, also in the Stewartry.

Since the Show of 1860 several events of outstanding interest to agriculturists had occurred. There was in 1862 that great Show at Battersea in conjunction with the Royal English Agricultural Society, where Scotch breeders made a very creditable appearance. Then in 1866 came that terrible scourge, the rinderpest. Fortunately this part of the country did not suffer so seriously as did some other districts. In certain parts of Dumfriesshire the plague prevailed, but it did not spread into Galloway beyond the neighbourhood of Dumfries. Another important event was the resignation of Mr Hall Maxwell, who, amongst much other valuable work during his term of office as Secretary to the Society, had been instrumental in beginning the collection of the Agricultural Statistics afterwards undertaken by the Government.

In connection with the exhibits of cattle in 1870 few novel features have to be noted. Most of the old exhibitors of Galloway cattle are again in the list and taking prizes. In the Short-

horn classes local exhibits had fallen off. There was a large display of Ayrshire cattle, both from the district and other parts of the West. A number of fat cattle were shown, all of them Galloways.

Of horses for agricultural purposes there was a large entry, both by local and other breeders. The lion's share of the prizes left the district.

For the first time here horses suitable for "the field" were exhibited. Carriage-horses and ponies were likewise shown. There was a large and very fine show of sheep. Of both butter and cheese there was an excellent display, but little of either was from local makers.

Lectures on horse-shoeing by the famous Charlier formed an interesting and appropriate novelty.

By this time the Implement section of the Show had assumed its due importance, containing as it did a large and very interesting collection, including machines worked by steam.

The drawings at the gates still kept on increasing, rising on this occasion to £1897—£622 more than in 1860, and no less than £1457 over the drawings in 1845.

Show of 1878.

This Show was held on the same farm and in the same month as the Show of 1870. It was a brilliant success. The weather was on its best behaviour, and the drawings amounted to no less than £3308,—a sum that has been exceeded only seven times in the history of the Society—four times at Edinburgh, twice at Aberdeen, and once at Glasgow. That surely is something of which the Dumfries district may well be proud!

And of the display of live stock and implements it need only be said that it was in every way worthy of the great success of the Show in other respects. In the prize-list I notice, besides the names of many other well-known local farmers and breeders, the name of Mr Andrew Montgomery, who has since so highly distinguished himself as a breeder and exhibitor of Clydesdale horses.

The show of dairy produce was very large, and several prizes for cheese went to Wigtownshire. Sir Mark Stewart, who has since won so many prizes for Ayrshire cattle and dairy produce, was then just beginning to come to the front.

The dinner on this occasion was poorly attended, and the speeches show a great falling off, lacking as they were in the able and practical handling of agricultural questions which characterised the speeches on previous occasions. The Show was an excellent one for business. It was reported that Mr Andrew Montgomery sold a Clydesdale stallion to go to New

Zealand for £1500, "less a luck-penny." Several other high prices for animals were spoken of; and implement exhibitors are said to have been highly satisfied with the amount of business done in their department.

At the time of this Show the Rev. John Gillespie, Mouswald, was entertained to dinner and presented with a piece of plate by breeders of Galloway cattle, in recognition of his services as Secretary of the Galloway Cattle Society; and so untiring and valuable have been Mr Gillespie's services to agriculture in other respects, as well as in connection with Galloway cattle, that some twelve years later he was the recipient of a still more tangible token of thanks, in the shape of an address and a purse of over 700 sovereigns, presented to him at a dinner in the town of Dumfries, presided over by my eldest son, Mr W. J. Maxwell, yr. of Munches. Mr Gillespie is the son of a much-esteemed tenant of the late Mr Hope-Johnstone of Annandale—the Mr Gillespie, indeed, who took part in the discussions on agricultural subjects in connection with the Show of 1845. This, however, in passing.

Show of 1886.

Once again the Show was held on the farm of Rotchell. Bad weather spoiled the Show financially, but in other respects it was successful.

A novel feature on this occasion was a stack of silage, which aroused a good deal of interest. The silage system, although evidently useful in many parts, has not been largely adopted in this district. A Dumfriesshire farmer for several years silaged brackens successfully, but he had to give up the practice for the reason that on account of the persistent cutting when young the brackens began to fail.

There was an excellent show of all kinds of farm live stock, excepting swine, which made but a very poor display.

Show of 1895.

Coming now to the latest of the eight Highland Shows at Dumfries, I need say little of that very successful meeting. It was held on the farm of Terreglestown, near Maxwelltown railway station. It was a great success financially, especially in view of the very bad weather on the closing day.

The exhibits showed no falling off either in numbers or quality. The manner in which the cattle and horses were paraded in the large ring attracted great attention, and resulted in a large increase in the drawings from the grand stand. This, together with greater economy in the general management of

the Show, which in no way lessened the comforts of the exhibitors, tended to enhance the financial results.

The arrangements were in every way most complete, giving general satisfaction to exhibitors and visitors, and being highly to the credit of all the officials of the Society.

General Remarks.

We have thus had a hurried and imperfect glance at the eight Highland Shows which have been held at Dumfries. These eight Shows have been held under the management of four Secretaries—Sir Charles Gordon, Mr Hall Maxwell, Mr Fletcher Norton Menzies, and Mr James Macdonald. And what changes there have been in the Board of Directors and Committees of the Society since 1830! How completely, again, has the Show itself changed! The Society has moved with the times, and this spirit of change has ever gone hand in hand with a spirit of progress. Following upon all, as the natural consequence, has come a great and a steady growth in the operations and resources of the Society. The Shows themselves may not in recent years appear to maintain an increasing scale in all sections, but the Show is only a part of the Society's work. In other respects the Society seeks to promote the wellbeing of agriculture, and as time goes on the scope for operations in these other spheres increases rather than diminishes. Much more, indeed, is expected from our National Agricultural Society than merely conducting its great annual Show.

So as to bring into a narrower view the outstanding features of the eight Highland Shows which have been held at Dumfries, the following table is here produced:—

STATISTICS OF EIGHT DUMFRIES SHOWS.

| YEAR. | NUMBER OF ENTRIES. | | | | | | | Amount offered in Premiums. | Gate-money and Catalogues. |
|---------|--------------------|---------|--------|--------|----------|----------------|------------|-----------------------------|----------------------------|
| | Cattle. | Horses. | Sheep. | Swine. | Poultry. | Dairy Produce. | Implement. | | |
| 1830. . | 180 | 62 | 247 | 19 | ... | ... | 18 | £353 | £163 |
| 1837. . | 181 | 77 | 512 | 15 | ... | 31 | 36 | 650 | 382 |
| 1845. . | 297 | 75 | 537 | 62 | 101 | 88 | 143 | 900 | 440 |
| 1860. . | 298 | 166 | 558 | 54 | 216 | 195 | 911 | 1500 | 1275 |
| 1870. . | 374 | 171 | 817 | 76 | 402 | 130 | 1873 | 1600 | 1897 |
| 1878. . | 357 | 328 | 621 | 39 | 303 | 235 | 2578 | 2763 | 3308 |
| 1886. . | 287 | 312 | 505 | 32 | 144 | 146 | 1639 | 2583 | 2314 |
| 1895. . | 269 | 333 | 416 | 26 | 245 | 114 | 2265 | 2456 | 2600 |

The two Shows which one is most strongly tempted to compare are those of 1845 and 1895. Two meetings with an interval of half a century between them cannot fail to suggest many interesting reflections. To one who saw them both, who had, so to speak, a finger in both pies, these reflections naturally possess a peculiar fascination, a tinge of sadness sobering the contemplation of much that would seem to be matter for gratification. If one could but reproduce vividly enough this picture and that—the agriculture of the Dumfries district in 1845 and that in 1895; the Dumfries Highland Show of 1845 and that of 1895—the representation would be deeply interesting, not merely to the agriculturist but to every intelligent observer of our country's progress.

Assuredly the agricultural progress of the past half-century has been great. Greater still have been the changes; for I cannot admit that all the changes have been in the direction of progress,—all changes have not been changes for the better.

Glancing now at some of the outstanding features of the Shows of 1845 and 1895, I would first notice the great change in the exhibits of horses. The systematic breeding of Clydesdale horses, now so successfully pursued, was not begun in this district till long after 1845. Here the change which has taken place has been an inestimable gain to agriculture.

Then the giving of prizes for hunting-horses, and horses for driving and jumping, is a comparatively recent innovation. The driving and jumping—the latter especially—are, we are told, contrivances introduced to swell the drawings at the gates and grand stands. Is this a change for the better? We need not pause to decide; show managers will have their way!

We have seen that once upon a time the dairy produce of this district was so bad as to be a by-word in the market. The district is now celebrated far and wide for the high character of its cheese. A wonderful change for the better, surely! But in the great development in the dairy industry some incidents cause regret to a Galloway man. The Ayrshire cow has to a large extent taken the place of the old breed of the district. In many cases, too, the natives of the district have been displaced from their farms by men from the counties of Ayr and Lanark, who have somehow seen their way to pay higher rents.

The extension of the railway system has favoured the dairy industry. Fresh milk and butter are now daily sent distances of 200 or 300 miles—a proceeding that would have astonished our ancestors, who considered the calves entitled to the greater portion of their mother's milk, and who would have been dismayed at the wholesale disposal of calves. Skim-milk cheese, at one time largely made in this district, is now almost unknown.

Perhaps in no department of the Show has there been a greater change than in that of implements. In the Show of 1845 there were but 143 exhibits of implements. In 1895 the number was 2265, and what a varied and interesting collection it was! To many, indeed, this section is the most interesting in the Show. Farmers have gained much by the introduction of improved labour-saving implements and machines. With the increasing cost, and the growing scarcity of labour, it would be difficult to imagine what the plight of the farmer would have been without the aid he has received from improved implements and machines.

The large extent to which steam and other motive powers, such as gas and oil, are now employed in working machines on the farm is well illustrated in the motion-yard of the Highland Show—always one of the most popular sections of the show-yard. Needless to say, there was no motion-yard in the Show of 1845.

Fifty years ago the corn crops were cut by the hook or sickle; and an interesting sight it was to see twenty or thirty shearers, mostly women, at work in bands on the harvest-field. The scythe followed, only to be cut out by the reaper; and now the self-binder claims the field. And a solitary, sad-looking "hairst-field" it is! No longer do we see the merry gangs of laughing lads and lasses; in their stead we have the lifeless machine, with its ceaseless "whirr, whirr," in its dreary rounds. Financially a change for the better, no doubt; but is there no tinge of sadness here?

If the glory of the "hairst-field" has departed, so has the heyday of wheat-growing. Wheat was worth 50s. per quarter in 1845. Last year's price was 25s. A sad change for the farmer, surely! Nowadays in this district there is little barley grown, and still less wheat. Oats are of course the prevailing cereal. Except where they can be conveniently shipped or sent by rail, potatoes are not grown in large quantities. The potato disease came to us about 1845, and is with us still. Happily it is not often so virulent now as in former times.

Turnips are the great green crop of the district. Finger-and-toe often plays great havoc with the turnips in this district. Some thirty or forty years ago the Lockerbie Farmers' Club, under the management of the late Mr Charles Stewart, factor on the Annandale property (undoubtedly one of the ablest agriculturists in Dumfriesshire), published annually carefully prepared statements of the weights of the turnip crop, with particulars of manurial treatment, on a number of farms within its bounds. I have before me the statement for 1855, which gives a full return of the crop on no fewer than thirty farms. From this statement I take the following table, giving the

average weight per statute acre of turnips on the farms inspected in each of the seven years—1849-1855:—

AVERAGE YIELD OF TURNIP CROP ON ANNANDALE FARMS.

| | 1849. | 1850 | 1851. | 1852 | 1853 | 1854. | 1855 |
|---------|----------|----------|----------|-----------|----------|----------|----------|
| | tons cwt | tons cwt | tons cwt | tons cwt. | tons cwt | tons cwt | tons cwt |
| Swedes | 21 16 | 24 9 | 19 16 | 23 7 | 21 19 | 20 8 | 24 7 |
| Yellows | 20 10 | 19 14 | 17 0 | 17 7 | 23 4 | 18 13 | 20 17 |
| Common | 22 7 | 25 14 | 21 1 | 23 14 | 27 13 | 22 0 | 25 12 |

In most cases the width of drill was 27 to 28 inches; some as narrow as 26 and others as wide as 29 inches. On most farms the roots were thinned to from 9 to 10 inches apart; but it is remarked that one of the heaviest crops of Swedes—35½ tons (on the farm of Hardgrave, in Dalton parish)—was thinned to quite 12 inches apart. The seed was generally sown between the 21st of May and 20th of June. In a few cases white turnips were sown in July, and gave from 15 to 20 tons of roots per acre. The method of manuring varied greatly. In almost every case farmyard dung was given, usually from 15 to 20 loads per acre—in some cases more. Peruvian guano was used on every farm—about 2 to 2½ cwt. per acre. Dissolved bones and crushed bones were also applied with good results. In one or two cases superphosphate was tried.

Amongst lairds and tenants as well as in farming customs there have been many, many changes since 1845. The larger landed properties in this district remain for the most part in the same families, but not a few of the smaller estates have changed hands—some of them several times. Greater still have been the changes amongst the tenants. Then the labourers, of course, are often changing. Ploughmen, or cotmen as we call them, are now to a large extent paid in money. Since 1845 their wages have increased nearly one-third. Day-labourers, such as drainers, have become very scarce. Their wage has risen from 1s. 6d. to 2s. 6d., or even more, per day. These labourers now mostly prefer to live in villages, and many cottages in country districts are falling into ruin for want of occupants.

Still one other change for the worse I must mention,—and a most serious cause of unpleasantness between landlord and tenant it has proved to be. I refer to the encouragement given to the raising of rabbits. Until about fifty years ago the rabbit plague was little known in this district, but now it has a strong

hold and causes much trouble. The extermination of the rabbit would be a blessing to all agriculturists.

Turning once more to figures, I have some significant changes to show in the valuation of the stewardry of Kirkcudbright at various dates. Exclusive of railways the valuation in 1861 was £249,437; it rose to £366,138 in 1882, and by 1893 it had fallen to £319,806. It is to be feared the lowest point in the fall has not been reached.

Long ago in the winter months a considerable trade was done in bacon-curing in the town of Dumfries. Since the introduction of the dairy industry it has nearly ceased. Large numbers of pigs are still bred in the district, but they are mostly sold alive for the southern markets during summer. There is little or no demand for fresh pork in this locality. In the winter of 1867-68 no fewer than 26,081 carcasses of pigs were sold in Dumfries. These were equal to 388,455 stones, valued at £105,763.

Another notable change has taken place in the town of Dumfries. In bygone times large markets were held on the sands there almost every week. In 1853, 27,776 cattle—chiefly Galloways and Highlanders with a few crosses from Ireland—were sold on the Dumfries sands. Now these markets have almost entirely ceased. The auction marts, of which there are about half a score in the district, have quite taken their place,—a change this for which there is not a little to be said on both sides.

I will close these hurried reminiscences by noting one other change in the Show arrangements. We have seen how successful were the Show dinners in olden times. What has become of these festive gatherings?

BIRD INVESTIGATION.

AN INQUIRY CONCERNING THE RELATION OF CERTAIN BIRDS
TO THE AGRICULTURAL INTEREST, AS SHOWN BY THEIR
DIET.

By JOHN GILMOUR of Lundin and Montrave, Leven, Fifeshire.

FOR many years I had held the opinion that an endeavour to prove, if possible, the good and the ill done to the farmer by the wood-pigeon, the rook, and the starling would be not only most interesting, but probably of some practical use. I gladly, therefore, availed myself of what seemed a good opportunity, and

commenced an inquiry into this important question in the year 1894.

From March 1894 to February 1895 inclusive, I had the pleasure to report monthly to the Directors of the Highland and Agricultural Society of Scotland the results of this investigation as it proceeded. The object of the inquiry was to ascertain the particular articles of diet consumed in the different seasons of the year by wood-pigeons, rooks, and starlings; and it was undertaken in the hope that some facts useful and interesting to agriculturists would be clearly defined, and that any doubts which exist as to whether the birds named are friends or enemies of the farmer would, at least to a certain extent, be cleared up.

The matter seemed to me to be of sufficient practical interest to warrant an exact inquiry and research, carried out on a scale sufficiently wide to yield for our information and guidance at least the broad facts of the case.

I am aware that objection may be taken to the fact that, instead of the birds examined coming from many parts of Scotland, they were chiefly procured on one estate in Fifeshire, and that, at any rate, all came from the same district. It may, however, be allowable to point out that, bounded as it is at its southern extremity by the sea-shore, rising towards the north to an altitude of 500 to 600 feet above sea-level, and situated in the centre of a well-cultivated arable district, that estate may be considered as likely to produce food both of such quantity and variety as to ensure that the birds examined gave a very fair sample of the food of the same classes of birds all over the Lowlands of Scotland. In researches of this description it always seems to me that when localised, they are the more valuable for future use and for purposes of comparison.

It is only right to note that in Fifeshire nearly two months of prolonged frost and exceptional cold occurred during the period covered by this investigation; but as this was the general character of the weather over Scotland, I do not suppose, even had the inquiry been spread over a wider area of country, that the results, owing to this cause, would have been to any great extent different from what they are.

I had the good fortune at the commencement of this investigation to enlist the enthusiastic interest and active work of Professor M'Alpine, Botanist to the Highland and Agricultural Society, who with his usual energy took upon himself the onerous duty of examining the crops and gizzards of the birds, and of carefully noting all results of the examinations made. In this work I know he would desire to very gratefully acknowledge the great assistance he received from his colleagues, Messrs Campbell and Seton, of the Glasgow and West of Scotland Technical College.

As a result of Professor M'Alpine's careful attention to all

details, I am now in a position to place in a form which I trust may be of interest not only to members of the Highland and Agricultural Society, but to agriculturists generally, the result of a twelvemonth's observation of the foods of the birds named.

Here I may mention that on the recommendation of Miss Ormerod the identification of the insects found in the birds was intrusted to Mr Mosley, entomologist, Huddersfield.

As the accompanying tables show, a careful record was kept as to where and when the birds were shot, and as to the weather which prevailed at the time.

A fairly large and regular number of birds was obtained, the actual number being—

| | Males. | Females. | Total. |
|-----------------|-----------|-----------|-----------|
| Pigeons . . . | 143 | 122 | 265 |
| Rooks . . . | 167 | 188 | 355 |
| Starlings . . . | 114 | 76 | 190 |
| | <hr/> 424 | <hr/> 386 | <hr/> 810 |

In drawing up the accompanying tables, Professor M'Alpine's view and desire have been to state the facts in such a way that, should others interested in such work make similar investigations in the future, comparisons may easily be made.

It is now a good many years ago since the Earl of Haddington made in East Lothian a most interesting investigation concerning damage done to crops by *wood-pigeons*. The result of that investigation brought his lordship to the conclusion that though doubtless the wood-pigeon feeds upon certain noxious weeds, still any slight benefit to agriculture of this nature is far more than counterbalanced by the excessive consumpt of grain.

It will be seen from a perusal of the notes of the present investigation (conducted, as it has been, quite independently of all previous experiments) that as years go by the character of the wood-pigeon does not improve, but that his destruction of clover and grain far outweighs any benefit he may effect.

While I was fully prepared to find that facts were all against the wood-pigeon, I was, I confess, in hopes that our particular inquiries into the diet of the *rook* would clearly prove that, if not over-abundant, he might to a considerable extent be a friend to the farmer. Judging from the results of this special investigation as tabulated, I fear figures go badly against him.

From the facts and figures laid before him in the following pages, the reader must form his own conclusions. Beyond this I should like to call attention to the enormous amount of damage done by rooks during winter to stacked grain. The determined manner in which, when frosty weather sets in, squads of rooks in the most barefaced manner attack stacks, even when well thatched and in stackyards close to steadings,

might be amusing if it were less aggravating; and undoubtedly one of the worst services that the rook does to the farmer is the havoc and destruction of stacks badly thatched or erected in the fields at a distance from protection.

The result of the present investigation is to confirm me in the opinion I have long held, that rooks in the enormous quantities in which we have them in counties such as Fife, do an immense amount of damage; and I would urge those who have the control of rookeries to see that the numbers of their inmates are kept within reasonable limits.

The *starling*, as a perusal of the record of his food will show, comes out of the examination with flying colours, and must be regarded most certainly as a friend of the farmer.

Many are the charges brought against the starling. It is averred that he has a *penchant* for the eggs of larks, and has no objection occasionally to a young and tender nestling. However this may be, whether the very rapid digestive powers of the bird has stood him in good stead, undoubtedly Professor M'Alpine has been unable to convict the Fifeshire starling of egg-stealing and cannibalism.

The enormous increase of this bird during past years—countless thousands now existing in the kingdom of Fife, where about fifty or sixty years ago they were looked upon rather as a rarity—is one of the most interesting questions of bird life; but it is not my province in this paper to deal with this subject, or with the serious damage done to shrubs and young plantations when these are taken possession of by countless myriads of starlings as their roosting-places. For many reasons collateral matters of biological interest and importance are not dealt with now. The object has been simply to look at the birds from a fixed view-point, and to see them truly in this light. In point of fact we consider solely how and in what ways pigeons, rooks, and starlings are beneficial or injurious to the agricultural interest, how they aid or interfere with the crops which the agriculturist takes pains to rear.

I need hardly say that the carrying out of this investigation has been to me a thorough pleasure and instruction, and I cannot refrain from saying that the pleasure has been enhanced beyond measure by the heartiness with which all concerned, headed by Professor M'Alpine, have entered upon and carried out the work.

PIGEONS.

SECTION 1.—NUMBER.

For the purposes of this investigation 265 pigeons were shot (in one or two cases trapped). The accompanying table shows

the number of these birds shot during each month, and the number with perfectly empty crops:—

PIGEONS EXAMINED DURING TWELVE MONTHS, MARCH 1894
TO FEBRUARY 1895.

| | 1894. | | | | | | | | | | | 1895. | | Total |
|--|-------|--------|------|-------|-------|------|-------|------|------|------|------|-------|-----|-------|
| | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | | |
| Total number of birds examined | 25 | 26 | 23 | 24 | 24 | 25 | 21 | 24 | 21 | 12 | 21 | 19 | 265 | |
| Number of empty birds . | 0 | 1 | 1 | 2 | 1 | 2 | 6 | 2 | 3 | 0 | 0 | 1 | 19 | |

It may be noticed from the above figures that the number of birds with crop contents is 265 minus 19—that is, 246, or rather 245, since one diseased pigeon was left out of the count and its crop not examined.

SECTION 2.—THE STAPLE FOODS.

By carefully studying the contents of pigeon-crops taken all the year round it is perfectly easy to express in figures all the important facts relating to the foods. By simply tabulating the number of times that each kind of food ingredient is found, we are at once put into possession of the facts regarding frequency of occurrence or, which amounts to the same thing, the order of importance of the various foods used. Five fairly natural groups—1, Roots; 2, Leaves; 3, Flowers; 4, Cereal grains; 5, Other fruits and seeds—grasp and contain all the food-stuffs actually found in pigeons.

SECTION 3.—RELATIVE IMPORTANCE OF THE VARIOUS FOODS.

When these five groups are arranged in order of frequency—*i.e.*, of importance—they stand thus: 1, Cereal grains; 2, Leaves; 3, Other fruits and seeds; 4, Roots; 5, Flowers. The accompanying tabular statement gives the figures actually found:—

| Kind of Food. | No. of times taken during the year. | Per cent. |
|--------------------------------|-------------------------------------|------------|
| Cereal grains | 123 | 33 |
| Leaves | 103 | 27·5 |
| Other fruits and seeds | 88 | 23 |
| Roots | 31 | 8·5 |
| Flowers | 29 | 8 |
| Total | <u>374</u> | <u>100</u> |

These numbers show quite clearly (1) that cereal grains and leaves are the foods most freely used by pigeons, (2) that roots and flowers are of quite subordinate importance.

Very little reflection suffices to make us aware that the number of food items contained in 245 pigeon-crops is not exactly 245, but some larger number, since a single crop may and often does contain more than one article of diet. Bearing this in mind, we can have no difficulty whatever in understanding the meaning of the number 374 so frequently brought forward when dealing specifically with the question of pigeon diet. The number 374 means that the 245 pigeon-crops contained 374 articles of diet—grains, leaves, fruits and seeds, roots, and flowers.

Grain- and Leaf-devouring Capacity—Furthermore, these figures point as strongly as figures can to the well-recognised fact that pigeons are grain-devouring or graminivorous birds, and to a thing of equal or even greater agricultural import, though not so usually recognised, that pigeons are markedly, very markedly, leaf-devouring birds. It may be said that their total propensity for grain—using the word in a general sense—is not fully measured by the number 123, and that we ought to add to this the number 88 for seeds and grains other than cereal. This done, we have the grand total 211, or 56 per cent. But, from an agricultural standpoint, grain means cereal grain; and from this aspect the figure given for grain in the table above—viz., 123, or 33 per cent—is the agricultural measure of the grain-devouring capacity; and the leaf-devouring propensity—27½ per cent—is not so very far behind.

| | | | | Per cent. |
|--------------------------|---|---|---|-----------|
| Grain-devouring capacity | . | . | . | 33 |
| Leaf-devouring capacity | . | . | . | 27½ |

SECTION 4.—FOOD SOURCES.

We must pursue these figures farther to their very issue, and make plain each and every item grasped under the general name *kind of food*, and point out the source from which it is derived; for did we not set out with the avowed intent of tracking the effect of the bird on each kind of agricultural plant, whether crop, weed, or tree? This amounts to saying that we require a complete inventory of the plants and parts of plants attacked arranged under the heads crops and weeds. Here is this bill of fare, as we may call it, suitable for all the natural phases of pigeon life during the whole year:—

| Kind of Food. | Crops. | Weeds. |
|----------------|----------|--------|
| Cereal grains. | Barley. | |
| | Oat. | |
| | Wheat. | |
| | Rye. | |
| Leaves. | Clovers— | |
| | Red. | |
| | White. | |
| | Alfalfa. | |

| Kind of Food. | Crops. | Weeds. |
|---|---|--|
| | Cruciferae— Turnips. Swedes. | Cruciferae— Charlock. Runch. Creeping buttercup. Oak, from tree. |
| Fruits and seeds other than cereals. | Leguminosae— Beans. Peas. Tares. Clovers. Cruciferae— Turnips. Swedes. Grasses— Ryegrass. • Seeds of mixtures sown. Maize, &c., from artificial foods. | Cruciferae— Charlock. Runch. Goose-grass. Spurrey. Mouse-ear chickweed. Common chickweed. Field speedwells. Docks. |
| | Trees and shrubs— Elm-fruits. Beech-nuts. Wild cherries. Haws. | |
| Roots and under- ground stems. | Turnips. Swedes. Potatoes. | Pilewort, or lessercelandine. |
| Flowers. | Trees— Beech. Elm. | Charlock. Creeping buttercup. Annual meadow-grass. |

Add to the above a few earthworms taken for the use of the very young birds, and the bill of fare is complete.

It is immediately perceived that this dietary for pigeons is a most elaborate affair; that the bird is a very dainty vegetarian, and, at the same time, a most dangerous fellow, inasmuch as he attacks and uses the very best of all our crops—the grains of all our cereals; the leaves of all our clovers and turnips, though grass is not good enough for him; the seeds of beans, peas, tares, and clovers; our grass mixtures, and so forth. It would be very unfair, indeed, not to draw attention at the same time to the large number of weeds attacked and used by him—pestilent weeds such as charlock and runch being of the number.

SECTION 5.—TOTAL INJURIES AND BENEFITS.

The bird must have his due, and it behoves us straightway to express in figures the number of attacks on crops on the one hand, on weeds on the other. If the balance stands against the pigeon to any large extent, we cannot but proclaim him for what he is.

| PART OF PLANT USED. | CROPS. | TREES. | WEEDS. |
|----------------------------------|---------------------|---------------------|---------------------|
| | No. of times taken. | No. of times taken. | No. of times taken. |
| Roots | 29 | 0 | 2 |
| Leaves | 79 | 1 | 23 |
| Flowers | 0 | 13 | 16 |
| Cereal grains | 123 | 0 | 0 |
| Other fruits and seeds | 23 | 33 | 32 |
| | <u>254</u> | <u>47</u> | <u>73</u> |

There is no uncertainty, no dubiety about the meaning here: the figures as given by himself condemn, and we cannot but convict. The root crops stand entirely against him; amongst the leaves, the clovers accuse him most strongly; and in the case of cereal grains no extenuation whatever for his outrage is offered. Though grain be left entirely out of court, the pigeon stands utterly condemned by the heavy black score still standing against him for root-crop and clover-leaf destruction.

SECTION 6.—THE FOODS MOST SOUGHT AFTER.

We now arrange the food items in order of importance, with the object of bringing into prominence the specific foods most eagerly sought after and preyed upon by these birds: three columns headed—1, Crops; 2, Weeds; 3, Trees, to indicate the sources of the supply, are sufficient for our purpose.

PIGEON FOODS ARRANGED IN ORDER OF IMPORTANCE.

| FROM CROPS. | No. of times taken. | FROM WEEDS. | No. of times taken. | FROM TREES. | No. of times taken. |
|-----------------------------------|---------------------|---------------------------------------|---------------------|-------------------------|---------------------|
| Barley-grains | 81 | Charlock and runch leaves | 22 | Elm-fruit | 18 |
| Clover-leaves | 41 | Spurrey fruits | 11 | Beech-nuts | 12 |
| Turnip and swede leaves | 38 | Charlock and runch flowers | 9 | Beech-flowers | 11 |
| Oat-grains | 29 | Cruciferous seeds | 7 | Elm-flowers | 2 |
| Potato-tubers | 23 | Buttercup-flowers | 6 | Wild cherries | 2 |
| Bean-seeds | 14 | Dock-fruits | 6 | Oak-leaves | 1 |
| Wheat-grain | 12 | Speedwell-fruits | 4 | Haws | 1 |
| Turnip and swede roots | 6 | Chickweed-fruits | 3 | Total | <u>47</u> |
| Grass-seeds | 4 | Pilewort-roots | 2 | | |
| Tares | 2 | Buttercup-leaves | 1 | | |
| Ryegrass-seed | 1 | Annual meadow-grass flowers | 1 | | |
| Rye-grain | 1 | Goose-grass seed | 1 | | |
| Maize (artificial food) | 1 | Total | <u>73</u> | | |
| Pea-seed | 1 | | | | |
| Total | <u>254</u> | | | | |

This census shows very forcibly that the pigeon loves the tenderly nurtured crop plant, and, for the most part, disdains the humble weed: there can, indeed, be no doubt that the scare-pigeon is as necessary as the scare-crow. From the figures we see clearly that barley and clover must above all else be guarded against ravage. We may learn the further lesson that all seeds

of the turnip kind, and the young plants which spring therefrom, may require special attention, since cruciferous crops and weeds are heavily and eagerly run upon.

SECTION 7.—FOODS CONSUMED EACH MONTH.

As yet we have assigned no specific time of year to the facts which we have brought forward, and now is the place to dip more deeply into the figures, to unravel them, and to set them out in their due sequence according to the months in which the various attacks took place. It is easy to perceive that we are now coming to closest quarters and practical issues with the pigeon, to hand-to-hand combat with him so to say; and it is very right that we should do so, for is it not the business of the farmer to rear his crop in spite of every foe, and snap his fingers in the face of the enemy? The instincts and nature of the bird must be met and brought to book by the knowledge, skill, and foresight of the farmer with regard to time and place of attack. With this in view, we here arrange the pigeon foods according to the months of the year, and it is to be noted that the constituent or constituents most freely consumed during each month are given in thick type to draw attention.

CONTENTS OF PIGEON-CROPS FOR EACH MONTH OF THE YEAR.

| | 1894. | | | | | | | | | | | 1895. | | Total. |
|--------------------------|-------|--------|------|-------|-------|------|-------|------|------|------|------|-------|-----|--------|
| | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | | |
| Roots | 5 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 7 | 7 | 10 | 81 | |
| Leaves | 21 | 1 | 4 | 10 | 24 | 7 | 4 | 0 | 0 | 3 | 19 | 10 | 108 | |
| Flowers | 2 | 0 | 12 | 6 | 8 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 29 | |
| Cereal grain | 6 | 21 | 6 | 1 | 0 | 22 | 20 | 26 | 11 | 9 | 0 | 1 | 123 | |
| Other fruits and seeds . | 5 | 6 | 8 | 20 | 13 | 5 | 5 | 8 | 14 | 3 | 1 | 0 | 88 | |

The above table states in figures the number of times that each of the five general kinds of food-stuffs has been found in the pigeon-crops examined. We will now disentangle therefrom the figures which are in thick type, and expand them in order to get at and understand precisely their meaning. Our object now plainly is to realise and to be wide-awake to the point of maximum attack during each month of the year; accordingly we have drawn up the following monthly calendar. This calendar shows at a glance what the birds are chiefly after during each month, and we see that the pigeon has very definite runs: in March he goes for clover; in April he is after grain; in May he seeks the flowers of trees; in June he preys

on various plants—on any suitable crop plant he can find; in July he makes another raid on clover; during August, September, October, November, and December he uses grain; in January and February he is on root crops; and in March he is again in full swing with the clovers.

PIGEONS—MONTHLY CALENDAR SHOWING CHIEF POINTS OF ATTACK.

(Crop plants in italics).

| Month. | Parts attacked. | Total No. of Attacks. | No. of Attacks on each kind of Plant. |
|---------------|-----------------|-----------------------|--|
| March . . | Leaves . . | 21 | <i>Clovers</i> 11, <i>turnips and swedes</i> 9 (buttercup 1). |
| April . . | Grains . . | 21 | <i>Barley</i> 18, <i>oats</i> 3. |
| May . . | Flowers . . | 12 | (<i>Beech</i> 11, <i>charlock</i> 1). |
| June . . | Seeds, &c. . | 20 | <i>Beans</i> 1, cruciferous 3 (elm 15, chickweeds 1). |
| July . . | Leaves . . | 24 | <i>Clover</i> 9, cruciferous 15. |
| August . . | Grain . . | 22 | <i>Barley</i> 11, <i>oats</i> 10, <i>wheat</i> 1. |
| September . . | Grain . . | 20 | <i>Barley</i> 9, <i>oats</i> 6, <i>wheat</i> 4, <i>rye</i> 1. |
| October . . | Grain . . | 26 | <i>Barley</i> 19, <i>wheat</i> 5, <i>oats</i> 2. |
| November . . | { Grain . . | 11 | <i>Barley</i> 10, <i>wheat</i> 1. |
| | { Other seeds | 14 | <i>Beans</i> 3, <i>tares</i> 1 (beech-nuts 6, wild cherries 2, haws 1, maize 1). |
| December . . | { Grain . . | 9 } | <i>Barley</i> 6, <i>oats</i> 3. |
| | { Potato . . | 7 } | |
| January . . | Leaves . . | 19 | <i>Turnip and swedes</i> 18, <i>clover</i> 1. |
| February . . | { Roots . . | 10 | <i>Potato</i> 8, <i>swedes</i> 2. |
| | { Leaves . . | 10 | <i>Swedes</i> 8, <i>clover</i> 2. |

SECTION 8.—GENERAL CALENDAR OF FOOD TAKEN.

But the pigeon is no bird with one string to his bow; if he cannot get one thing he gets hold of another, as we easily understand when we recall the very various bill of fare used by him. It is incumbent upon us, therefore, to draw up a complete calendar in which all the habits, instincts, and runs of the bird are fairly represented. Accordingly there is here given (see next page) a compact view of the whole question of pigeon diet. The figure appended to each item indicates the number of times that such item has been taken.

SECTION 9.—THE RECORD.

This is a complete tabular statement (see pp. 32-59) of the data regarding the various birds examined. The first column is the number of the bird, the second the date on which it was shot, the third the time of day when shot, the fourth the state of the weather at the time; the fifth gives the locality and what the bird was doing.

The foods used are arranged in columns. Column 6 contains all the roots, column 7 all the leaves, column 8 the flowers, column 9 the cereal grains, column 10 all other fruits and seeds.

25 PIGEONS,

| No. | Date. | Hour. | Weather. | Place and Occasion. | Roots. | Leaves. |
|-----|-------|-----------|-----------------|---------------------|---------------------------|---|
| 1 | 3d | 6 p.m. | Fine | Lundin | ... | Full: clover and swede |
| 2 | ... | ... | ... | ... | ... | Full: swede young |
| 3 | ... | ... | ... | ... | ... | 1½ oz.: white clover and a little swede |
| 4 | 6th | 5 p.m. | Fair | Lundin | ... | 1 oz.: dry; red clover |
| 5 | ... | ... | ... | ... | ... | Full: white clover; |
| 6 | ... | ... | ... | ... | Pieces of swede: not full | occasional swede-leaf |
| 7 | 13th | 6 p.m. | Cold and bright | Lundin | ... | Full: white clover |
| 8 | ... | ... | .. | .. | ... | Partly full: swede |
| 9 | .. | .. | .. | ... | Swede | Swede |
| 10 | 17th | 6.30 p.m. | Good | Lundin | .. | Fairly full: swede |
| 11 | ... | ... | ... | ... | .. | White and red clovers, |
| 12 | ... | ... | ... | .. | ... | also buttercup |
| | | | | | | White clover |
| 13 | 20th | 6 p.m. | Cold and good | Lundin | ... | Swede: young sprouts |
| 14 | ... | ... | ... | ... | Swede | Swede |
| 15 | ... | ... | ... | ... | ... | ... |
| 16 | ... | ... | .. | ... | ... | White clover and a little red |
| 17 | 22d | 6 p.m. | Very fine | Lundin | ... | White clover |
| 18 | ... | ... | ... | ... | Swede | Red and white clovers |
| 19 | ... | ... | ... | ... | A few pieces of potato | do. |
| 20 | 26th | 3.30 p.m. | Very fine | Lundin | ... | ... |
| 21 | ... | ... | ... | ... | ... | ... |
| 22 | ... | ... | ... | ... | ... | ... |
| 23 | .. | ... | ... | ... | ... | ... |
| 24 | 29th | 6 p.m. | Extra fine | Lundin | ... | ... |
| 25 | ... | ... | ... | ... | ... | ... |

Change from one diet to another.—A glance at the leaf-column of the March record emphasises most strongly what has been already pointed out, that leaves—clover-leaves especially—are heavily run upon during this month. Pass the eye from the leaf-column to the bottom of that for grain, and a new run—this time on grain—is seen commencing at pigeon 21, or even earlier, at pigeon 17. This is a most instructive thing; the birds have been revelling in clover, and they lust for grain—they esteem most highly that which is most rare. Thus it happens that the first-sown seed must suffer terribly if pigeons are about, and the same would be the fate of any sown specially late. The birds fill themselves with grain to bursting-point: not content with crop full, they pack the gizzard also.

Grain.—Two points about this grain are in strong evidence—

1. The full 2 oz. which the crop of pigeon 21 contained.
2. The sprouted wheat-grain in pigeon 17. The obvious lesson is that the pigeon is a thorough dastard at sowing-time, and that he bears no dislike whatever to sprouted grain—he rather likes it.

MARCH 1894.

| Flowers. | Grain Fruits. | Other Fruits and Seeds. | Remarks. | No. |
|-----------------------------|--------------------------------|----------------------------|--|-----|
| ... | ... | ... | ... | 1 |
| ... | ... | ... | A few fragments of earthworms | 2 |
| ... | ... | Several dock-grains | Occasional pieces of ryegrass and Yorkshire fog leaf-blades | 3 |
| ... | ... | ... | ... | 4 |
| ... | ... | ... | ... | 5 |
| ... | ... | ... | The turnip mixed with earth and pieces of earthworm | 6 |
| ... | ... | 4 dock-grains | Contained one pupa of an insect | 7 |
| ... | ... | .. | ... | 8 |
| ... | ... | . | 5 or 6 dock-seeds in gizzard | 9 |
| ... | ... | ... | ... | 10 |
| ... | ... | .. | ... | 11 |
| ... | ... | . | .. | 12 |
| ... | ... | ... | ... | 13 |
| A few elm-flowers in bud | ... | ... | ... | 14 |
| Elm-flowers with bud-scales | ... | A few dock-grains | ... | 15 |
| ... | ... | ... | Crop secreting milky fluid | 16 |
| ... | Numerous sprouted wheat-grains | A few dock-grains | Spring-wheat had been sown | 17 |
| ... | .. | ... | ... | 18 |
| ... | ... | ... | Potatoes probably got from pits | 19 |
| .. | ... | 42 beans, and nothing else | Diet here commences to change from clover-leaves, &c., to grain and seed | 20 |
| ... | 2 oz. barley | .. | .. | 21 |
| ... | Oats | ... | ... | 22 |
| ... | Full of barley | ... | ... | 23 |
| ... | Full of barley do. | ... | ... | 24 |
| ... | | ... | ... | 25 |

Clover.—Going back to clover, we notice—

1. That the crop of pigeon 3 contained $1\frac{1}{2}$ oz.
2. That the clover taken represents the opening buds of the plant.
3. That the grain took the pigeons from the clover—enticed them from it, so to speak. One and a half oz. of clover-buds removed by a single pigeon is no small order: wherever pigeons are abundant, clovers must suffer much unless protected from such trenchant ravage.

Beans.—Notice pigeon 20, with 42 beans in its crop and nothing else.

Redeeming feature.—In column 10 we observe that four pigeons have managed to pick up a few dock-grains. This is, in one sense, a good feature; but it points strongly to lust for grain in general, and can in no sense be regarded as compensation either for clover destruction or for cereal grain removal. Doubtless, if dock and cereal grain were side by side on the ground, the cereal would be taken and the dock left behind.

26 PIGEONS,

| No. | Date. | Hour. | Weather. | Place and Occasion. | Roots. | Leaves. |
|-----|-------|-----------|----------------------|----------------------------|--------|-----------------------|
| 26 | 2d | 6 p.m. | Good | Lundin, in wood | ... | ... |
| 27 | ... | ... | ... | ... | ... | ... |
| 28 | ... | ... | ... | ... | ... | ... |
| 29 | ... | ... | ... | ... | ... | ... |
| 30 | 5th | 2.30 p.m. | Very fine | Nether Pratis, flying past | ... | ... |
| 31 | ... | ... | ... | ... | ... | ... |
| 32 | 5th | 2.45 p.m. | Very fine | Nether Pratis, flying past | ... | ... |
| 33 | 5th | 6 p.m. | Very fine | Lundin | ... | ... |
| 34 | 6th | 7 p.m. | Good | Lundin, in wood | ... | ... |
| 35 | ... | ... | ... | ... | ... | ... |
| 36 | 10th | 7 p.m. | Summer day | Lundin, in wood | ... | ... |
| 37 | ... | ... | ... | ... | ... | ... |
| 38 | 11th | 5 p.m. | Summer day | Lundin, in wood | ... | ... |
| 39 | ... | ... | ... | ... | ... | ... |
| 40 | ... | ... | ... | ... | ... | ... |
| 41 | 16th | 7 p.m. | Very mild | Lundin, in wood | ... | ... |
| 42 | ... | ... | ... | ... | ... | ... |
| 43 | ... | ... | ... | ... | ... | ... |
| 44 | 19th | 4 p.m. | Cold, E. wind | Lundin, in wood | ... | ... |
| 45 | 19th | 5 p.m. | Cold, E. wind | Lundin, in wood | ... | ... |
| 46 | ... | ... | ... | ... | ... | ... |
| 47 | 23d | 3.30 p.m. | Dull, cold, but good | Lundin, on tree | ... | A few pieces of swede |
| 48 | ... | ... | ... | ... | ... | ... |
| 49 | ... | ... | ... | ... | ... | ... |
| 50 | 26th | 5 p.m. | Very fine | Lundin, on tree | ... | ... |
| 51 | ... | ... | ... | ... | ... | ... |

Food.—The foods found in the crop were: Barley 18 times, oat 3. Bean 5 times, tares 1.

The mixtures taken were: Barley and oats in pigeon, 39; beans, barley, and oats in pigeon, 27; beans and tares in pigeon, 35.

Gizzard Contents.—When the crop was empty the gizzard contents were specially examined. In these cases the gizzard was also destitute of food, but the small white quartz stones used for grinding the grain were very conspicuous and abundant.

Prevalent Food.—Barley-grains and bean-seeds, often sprouted, constitute the prevalent food. In a single pigeon-crop 53 beans were found (No. 50). During March clover was the prevalent

APRIL 1894.

| Flowers. | Grain Fruits. | Other Fruits and Seeds. | Remarks. | No. |
|----------|--|-------------------------|--|-----|
| ... | Barley | ... | ... | 26 |
| ... | Chiefly barley, a little oat in addition | 5 beans | ... | 27 |
| ... | Barley | ... | ... | 28 |
| .. | do. | ... | ... | 29 |
| ... | Barley | ... | ... | 30 |
| ... | Oats | ... | Oats, probably from stack | 31 |
| ... | Barley | ... | ... | 32 |
| ... | Barley | ... | ... | 33 |
| ... | ... | 8 beans | ... | 34 |
| .. | ... | Beans and a few tares | ... | 35 |
| ... | Barley | ... | ... | 36 |
| ... | Sprouting barley | A few tares | One small gasteropod, as if taken accidentally | 37 |
| ... | Barley | ... | ... | 38 |
| ... | Barley and oat in equal amounts | ... | ... | 39 |
| ... | Barley | ... | ... | 40 |
| ... | .. | Sprouting beans | ... | 41 |
| ... | ... | ... | ... | 42 |
| .. | .. | ... | Empty: gizzard contained crushed grain and pieces of swede-shaw | 43 |
| .. | Sprouting barley | ... | Crop had secreted a milky fluid | 44 |
| .. | Sprouting barley | ... | ... | 45 |
| . | A few grain husks | ... | Almost empty: the gizzard was empty of food, but contained many stones | 46 |
| ... | Sprouting barley | 1 tare | ... | 47 |
| .. | do. | ... | ... | 48 |
| ... | A little barley | ... | This bird was almost empty in crop and gizzard | 49 |
| ... | ... | 53 beans, some sprouted | ... | 50 |
| ... | Sprouting barley | ... | ... | 51 |

food; but with approach of seed-time the clover, though now more abundant, is quite deserted, and there is a strong rush on sown seed. In pigeons 37, 41, 44, 45, 47, 48, 50, and 51, sprouted seeds were found. In fact a mere glance at the record for March shows that *pigeon diet now is entirely derived from farmer's seed.*

Effect on Crops.—If the number of feeds taken during seed-time is multiplied by number of birds, and this by the weight of each meal—say 2 oz. of grain or 53 beans—it becomes perfectly clear that the aggregate loss to farmers must be enormous. There is no redeeming feature, not even a sign of such, during this whole month.

23 PIGEONS,

| No. | Date. | Hour. | Weather. | Place and Occasion. | Roots. | Leaves. |
|-----|-------|-----------|-------------------|-----------------------|--------|-------------------------------|
| 52 | 1st | 7 p.m. | Fine | Lundin, in wood | | ... |
| 53 | ... | ... | ... | ... | .. | .. |
| 54 | ... | .. | .. | .. | ... | ... |
| 55 | 3d | 6 p.m. | Cold and blowing | Lundin, in wood | .. | .. |
| 56 | ... | ... | ... | ... | ... | .. |
| 57 | 7th | 7 p.m. | Good | Lundin, in wood | . | ... |
| 58 | ... | ... | ... | ... | ... | .. |
| 59 | 7th | 1 p.m. | Good | Lundin, found dead | | .. |
| 60 | 10th | 7 p.m. | Wet | Lundin, in wood | . | . |
| 61 | ... | ... | .. | . | .. | A few clover |
| 62 | ... | .. | .. | . | . | |
| 63 | 15th | 6.30 p.m. | Wet | Lundin, in wood | .. | ... |
| 64 | ... | ... | ... | ... | ... | .. |
| 65 | ... | .. | ... | ... | .. | ... |
| 66 | ... | ... | ... | ... | ... | .. |
| 67 | 22d | 7 p.m. | Lovely day | Lundin Wood, flying | .. | .. |
| 68 | ... | ... | ... | ... | ... | ... |
| 69 | ... | .. | ... | .. | ... | .. |
| 70 | 24th | 7.30 p.m. | Good | Bankhead Wood, flying | .. | .. |
| 71 | ... | .. | ... | ... | .. | .. |
| 72 | 28th | 8.30 p.m. | Very wet | Lundin Wood, on tree | .. | Young oak-leaves, with galls |
| 73 | ... | ... | ... | ... | .. | White clover |
| 74 | 31st | 12 noon | Showers, but good | Montrave | ... | A few pieces of clover-leaves |

Food.—The foods found were: Clover-leaves 3 times, barley-grain 3, oat-grain 3, grass mixtures 3 times. Oak-leaves 1 time, charlock flowers and leaves 1, various weed-seeds 4. Beech-flowers 11 times, elm-fruit 1.

Effect on Crops.—During this month, as during March, the sown seeds were taken; see, for example, pigeon 52. The bird has now much choice, and the diet is accordingly varied; but

MAY 1895.

| Flowers. | Grain Fruits. | Other Fruits and Seeds. | Remarks. | No. |
|--|--|--|--|-----|
| ... | Chiefly sprouted oat, with a little barley | . | The seeds evidently taken from sown fields | 52 |
| Beech | ... | .. | ... | 53 |
| do. | Oats and a little barley | .. | ... | 54 |
| ... | Oats, white and black | ... | ... | 55 |
| Beech | .. | . | . | 56 |
| Beech | .. | .. | .. | 57 |
| do. | .. | .. | .. | 58 |
| ... | . | .. | Diseased and practically empty | 59 |
| Beech | ... | ... | ... | 60 |
| do. | Barley | A sprinkling of red clover, perennial rye-grass, and goose-grass | This bird had been making free with farmer's mixture and goose-grass | 61 |
| do. | ... | ... | ... | 62 |
| Beech | ... | .. | ... | 63 |
| do. | ... | ... | ... | 64 |
| ... | ... | ... | Empty: gizzard contained remains of beech-flowers and stones | 65 |
| do. | ... | ... | The beech-flowers looked as if just plucked from the tree | 66 |
| ... | ... | Italian and perennial rye-grasses, also a field speedwell | Had been feeding on the grass mixture sown by the farmer | 67 |
| ... | ... | Elm, speedwell | ... | 68 |
| ... | ... | Speedwell | ... | 69 |
| ... | ... | A grass-seed mixture and speedwell | ... | 70 |
| ... | ... | ... | ... | 71 |
| Unopened cruciferous flowers, charlock | .. | ... | ... | 72 |
| ... | ... | Speedwell | ... | 73 |
| ... | ... | ... | Almost empty: the gizzard contained a few clover-leaves | 74 |

beech-flowers are in very high favour. Charlock was for the first time noticed in the bird during this month. Pigeon 62 was specially interesting: it had been making free with the farmer's grass mixture, and it was curious to find so many seeds of goose-grass (*Bromus secalinus*) evidently sown by the farmer himself.

| No. | Date. | Hour. | Weather. | Place and Occasion. | Roots. | Leaves. |
|-----|-------|-----------|-------------------|---------------------------------------|--------------------------|---|
| 75 | 5th | 8 p.m. | Good | Lundin Wood, on tree | ... | ... |
| 76 | ... | ... | ... | ... | ... | Full: red clover |
| 77 | 6th | 5 p.m. | Good | Lundin Wood, on tree | ... | White clover |
| 78 | 9th | 3 p.m. | Good | Nether Pratis, on barley- field | ... | ... |
| 79 | ... | ... | ... | ... | ... | A few pieces of alsike- leaves |
| 80 | ... | ... | ... | ... | .. | Full: alsike and a little red clover |
| 81 | 11th | 5 p.m. | Dull, but fair | Blacketyside, flying | .. | Occasional alsike |
| 82 | 13th | 5 p.m. | Lovely | Lundin Wood | ... | ... |
| 83 | 14th | 3 p.m. | Good | Balcormo, fly- ing | ... | ... |
| 84 | ... | ... | ... | ... | ... | .. |
| 85 | 19th | 5 p.m. | Good | Lundin, on tree | ... | ... |
| 86 | ... | ... | ... | ... | ... | ... |
| 87 | 19th | 7.30 p.m. | Good | Lundin, on tree | ... | ... |
| 88 | 21st | 2 p.m. | Good | Pilmuir, flying | ... | A few pieces of charlock |
| 89 | ... | ... | ... | ... | .. | ... |
| 90 | 21st | 7.30 p.m. | Good | Lundin, flying | ... | ... |
| 91 | ... | ... | ... | ... | ... | ... |
| 92 | 25th | 4 p.m. | Very fine | Aithernie Den, on tree | A few pilewort- roots | ... |
| 93 | ... | ... | ... | ... | Chiefly pilewort | ... |
| 94 | ... | ... | ... | ... | ... | ... |
| 95 | ... | ... | ... | ... | ... | White clover, a few |
| 96 | 23th | 2 p.m. | Good | Lundin Wood | ... | Clover |
| 97 | ... | .. | ... | ... | ... | do. |
| 98 | 23th | 8 p.m. | Good | Lundin | ... | Clover |

Food.—The foods found were: Clover leaves 9 times, oat-grains 1, beans 1, cruciferous seeds 3. Pilewort-roots 2 times, charlock-leaves 1, charlock-flowers 1, buttercup-flowers 4, flowers of annual meadow-grass 1, fruit and seed of mouse-ear chickweed 1. Elm-fruits 15 times.

Crops specially attacked.—Among the crops used as food we notice that clovers are first favourites—red, white, and alsike, all are affected. The birds are also very fond of cruciferous and leguminous seeds. One bird (No. 84) contained 40 beans. The elm above everything has to yield up its fruit as food for the bird.

Mixed Diet.—Bird No. 98 afforded an exquisite example of this: it contained some clover-

JUNE 1894.

| Flowers. | Grain Fruits. | Other Fruits and Seeds. | Remarks. | No. |
|--|---------------|---|---|-----|
| ... | Full oats | ... | ... | 75 |
| ... | ... | ... | ... | 76 |
| ... | ... | A few from elm | Not at all full | 77 |
| ... | ... | ... | Empty: gizzard contained partially digested flowers and leaves | 78 |
| A few cruciferous flowers, charlock | ... | ... | Almost empty: gizzard contained alsike-leaves and cruciferous flowers | 79 |
| ... | ... | ... | ... | 80 |
| ... | ... | Runch and other cruciferous seeds (rape?) | ... | 81 |
| ... | ... | Packed: elm | ... | 82 |
| ... | ... | ... | Empty: gizzard contained stones and remnants of leaves | 83 |
| ... | ... | 40 beans | ... | 84 |
| ... | ... | A few from elm | ... | 85 |
| ... | ... | A few fruits from elm | ... | 86 |
| ... | ... | Full: elm | ... | 87 |
| ... | ... | Full: elm | ... | 88 |
| ... | ... | do. | ... | 89 |
| ... | ... | Full: elm | ... | 90 |
| ... | ... | do. | ... | 91 |
| ... | ... | Elm, mouse-ear chickweed, and cruciferous seeds as in 81. | Not at all full | 92 |
| ... | ... | Elm-fruits and cruciferous seeds | ... | 93 |
| ... | ... | A few from elm | ... | 94 |
| Many young buttercup-flowers, <i>Ranunculus repens</i> | ... | Elm | ... | 95 |
| Buttercups, annual meadow-grass | ... | ... | ... | 96 |
| do. | ... | 1 elm-fruit | ... | 97 |
| 100 buds of buttercups | ... | Elm | The crop was packed to bursting-point with leaves, flowers, and fruits. The gizzard, like the crop, was also packed | 98 |

leaves, 100 flower-buds of creeping buttercup, and was filled up to bursting-point with elm-fruits. *Weeds.*—The pigeon is now seen in the light of a weed-killer, devouring pilewort-roots (the lesser celandine), charlock and munch, buttercups and chickweeds, and we must allow him to score his point here.

The intestinal contents of the birds were specially examined with the view of finding whether anything could pass out in a condition capable of reproducing the weeds taken. Crushing and digesting are operations so thorough and complete in the pigeon that it is utterly impossible even to conceive the reproduction of weeds from anything in pigeon-dung.

24 PIGEONS,

| No. | Date. | Hour. | Weather. | Place and Occasion. | Roots. | Leaves. |
|-----|-------|-----------|----------|---------------------------|--------|--|
| 99 | 3d | 4 p.m. | Good | Aithernie Den, on tree | ... | Red clover |
| 100 | 4th | 7.30 p.m. | Good | Lundin Wood, on tree | ... | White clover |
| 101 | ... | ... | ... | ... | ... | Packed with red clover |
| 102 | ... | ... | ... | ... | ... | do. |
| 103 | 9th | 3.30 p.m. | Good | Balcormo, on old grass | ... | ... |
| 104 | ... | ... | ... | ... | ... | Very little white clover |
| 105 | ... | ... | ... | ... | ... | Clovers |
| 106 | 11th | 4 p.m. | Wet | Lundin, on tree | ... | Clovers |
| 107 | 11th | 7 p.m. | Wet | Lundin, on tree | ... | ... |
| 108 | 17th | 6.30 p.m. | Fair | Lundin Wood, on tree | ... | Red and white clovers : cruciferous leaves |
| 109 | ... | ... | ... | ... | ... | Full : cruciferous leaves |
| 110 | 17th | 8 p.m. | Fair | Lundin Wood, on tree | .. | Red and white clovers : cruciferous leaves |
| 111 | ... | ... | ... | ... | . | Cruciferous leaves |
| 112 | 18th | 4 p.m. | Wet | Montrave, on grass | ... | Cruciferous leaves |
| 113 | 23d | 6 p.m. | Good | Lundin Wood, on tree | ... | Cruciferous leaves |
| 114 | 23d | 7 p.m. | Good | Lundin Wood, on tree | ... | Packed with cruciferous leaves |
| 115 | ... | ... | ... | ... | ... | do. |
| 116 | 23d | 7.40 p.m. | Good | Lundin Wood, on tree | ... | Cruciferous leaves : a little white and red clover |
| 117 | 26th | 4 p.m. | Wet | Lundin, flying | ... | Cruciferous leaves |
| 118 | ... | ... | ... | ... | ... | Very little cruciferous leaf |
| 119 | 30th | 4 p.m. | Good | Pilmuir, flying | ... | Traces of cruciferous leaves |
| 120 | ... | ... | ... | ... | ... | do. |

JULY 1894.

| Flowers. | Grain Fruits. | Other Fruits and Seeds. | Remarks. | No. |
|---------------------------------|---------------|---|---|-----|
| ... | ... | A few cruciferous seeds | Almost empty: probably rape (?) seed | 99 |
| ... | ... | Elm, mouse-ear chickweed, and perennial rye-grass | Elm most abundant | 100 |
| ... | ... | .. | ... | 101 |
| ... | .. | . | ... | 102 |
| ... | .. | ... | Empty: a few small pieces of poa-leaf found in gizzard | 103 |
| ... | .. | ... | Almost empty: gizzard contained clover-leaves | 104 |
| ... | .. | Common chickweed | More chickweed than clover | 105 |
| ... | ... | Common chickweed, fruits, and flowers | ... | 106 |
| .. | ... | Elm | .. | 107 |
| 25 buttercup flower-buds | ... | Spurrey | Chiefly spurrey: these seeds are so thoroughly crushed and digested that nothing capable of producing a plant can pass intestines | 108 |
| ... | . | .. | ... | 109 |
| Buttercups, cruciferous flowers | .. | Spurrey | Chiefly cruciferous leaves and flowers | 110 |
| Cruciferous flowers | .. | do. | Chiefly cruciferous leaves | 111 |
| Very many cruciferous flowers | ... | ... | ... | 112 |
| ... | ... | ... | ... | 113 |
| Cruciferous flowers | ... | Spurrey | ... | 114 |
| ... | ... | do. | ... | 115 |
| ... | ... | A good deal of mouse-ear chickweed | ... | 116 |
| ... | .. | A few spurrey fruits | The gizzard contained kernels of goose-grass | 117 |
| ... | ... | ... | Almost empty: gizzard contained leaves with a few spurrey and goose-grass seeds | 118 |
| A few cruciferous flowers | .. | ... | Almost empty: gizzard almost empty; contained traces of cruciferous leaves | 119 |
| ... | ... | ... | Almost empty: gizzard contained traces of cruciferous leaves | 120 |

24 PIGEONS,

| No. | Date. | Hour. | Weather. | Place and Occasion. | Roots. | Leaves. |
|-----|-------|--------|----------|---------------------|--------|--------------------|
| 121 | 30th | 7 p.m. | Good | Lundin, flying | ... | Cruciferous leaves |
| 122 | ... | ... | ... | ... | ... | do. |

Foods.—The record for this month is striking. The grain column is a complete blank. Though grain is not taken, the bird makes up for that by taking other fruits and seeds—spurrey and chickweeds. The fruit of the elm, so conspicuous last month, is now quite subordinate; it is only met with twice, and then in very small quantity. The column which has not a single blank is that for leaves. Clover-leaves figure largely—they occur nine or ten times, and in large quantities—and red is most abundantly represented. Turnip-leaf, however, was most freely taken, and is met with most frequently and most abundantly of all.

Mixed Diet.—Spurrey, known in some districts as “yar” and “carrow,” was taken with leaves of turnip and clover, flowers of buttercup and fruits of mouse-ear chickweed. In pigeon 108, for example, 25 flowers of creeping buttercup (*Ranunculus repens*), as well as clover-leaves, accompanied the spurrey.

JULY 1894.—CONTINUED.

| Flowers. | Grain Fruits. | Other Fruits and Seeds. | Remarks. | No. |
|---------------------|---------------|---|----------|-----|
| Cruciferous flowers | .. | A deal of spurrey, and a little mouse-ear chickweed | ... | 121 |
| ... | ... | A little spurrey | ... | 122 |

Crops specially attacked.—The clovers are freely attacked, and much more the turnips. The turnip-shaw, on whose presence and activity the value of the future crop depends, is at once the subject and the object of the ravage, and is most extensively interfered with.

Weeds.—During this month, however, the pigeon is at his best as a weed-destroyer, for he consumes the reproductive parts of such pests as spurrey, charlock, buttercups, chickweed, &c. All seeds taken are effectually destroyed by the grinding action of the gizzard-mill, and nothing which passes through the body is capable of growth. The pigeon is thus a crop-and-weed destroyer, but injury to crop is not at all compensated for by weed destruction.

25 PIGEONS

| No. | Date. | Hour. | Weather. | Place and Occasion. | Roots. | Leaves. |
|-----|-------|------------|----------------|------------------------------|--------|----------------------------------|
| 123 | 1st | 3.30 p.m. | Showery | Nether Pratis, on turnips | ... | Full: cruciferous leaves |
| 124 | 2d | 2.30 p.m. | Showery | Aithernie Den, flying | .. | Cruciferous leaves: turnips, &c. |
| 125 | 2d | 3 p.m. | Showery | Hatton, on turnips | ... | Cruciferous leaves |
| 126 | 2d | 4 p.m. | Showery | Pilmuir, flying | .. | Cruciferous leaves |
| 127 | 6th | 5.30 p.m. | Cold, but good | Pilmuir, on wheat-field | . | A little white clover |
| 128 | 9th | 3 p.m. | Flood | Lundin Wood | .. | .. |
| 129 | 9th | 6 p.m. | Flood | Lundin Wood | . | .. |
| 130 | 9th | 7 p.m. | Flood | Lundin Wood | . | .. |
| 131 | 13th | 3 p.m. | Good | Aithernie Den | ... | ... |
| 132 | 13th | 7 p.m. | Good | Lundin Wood, on tree | ... | ... |
| 133 | 15th | 5 p.m. | Good | Durie, on wheat | ... | .. |
| 134 | ... | ... | ... | ... | .. | ... |
| 135 | 15th | 6.30 p.m. | Wet | Aithernie Den, on tree | ... | ... |
| 136 | ... | ... | ... | ... | ... | ... |
| 137 | 16th | 12 noon | Good | Hatton, flying | ... | .. |
| 138 | 20th | 3 p.m. | Good | Montrave, flying | ... | ... |
| 139 | 20th | 5 p.m. | Good | Montrave, flying | ... | ... |
| 140 | 23d | 12.30 p.m. | Good | Sunnybraes, on tree | ... | Cruciferous leaves |
| 141 | ... | ... | ... | ... | ... | Very little cruciferous leaf |
| 142 | 23d | 1 p.m. | Good | Sunnybraes, on tree | .. | .. |
| 143 | ... | ... | ... | ... | ... | ... |

AUGUST 1894.

| Flowers. | Grain Fruits. | Other Fruits and Seeds. | Remarks. | No. |
|---------------------|--|------------------------------|---|-----|
| ... | ... | ... | ... | 123 |
| Cruciferous flowers | ... | ... | Gizzard contained five stones of the wild cherry | 124 |
| ... | .. | Field-speedwell | . | 125 |
| ... | . | A little spurrey | Gizzard contained eleven stones of the wild cherry | 126 |
| ... | Green barley and oat | Occasional spurrey | ... | 127 |
| ... | 12 barley-grains | 3 mouse-ear chickweed-fruits | Not at all full | 128 |
| ... | Full: barley | ... | ... | 129 |
| ... | Full: barley | . | Crop contained two quartz stones, probably for use in the gizzard | 130 |
| ... | .. | .. | Empty: gizzard contained remnants of barley-grain | 131 |
| . | Full: barley | .. | Grain in crop was mixed with a few quartz stones, probably for use in gizzard | 132 |
| ... | Full: barley | .. | ... | 133 |
| ... | ... | .. | Empty: gizzard contained traces of barley-grain and clover-leaves | 134 |
| ... | Crammed: oats | ... | ... | 135 |
| ... | Crammed: barley | ... | The gizzard was full of barley-grain | 136 |
| . | 3 barley-corns | . | ... | 137 |
| .. | Barley | .. | Many maggots were mixed with the grain | 138 |
| ... | $\frac{1}{2}$ oz. of oat and a little barley in addition | ... | ... | 139 |
| ... | A few barley and oat grains | ... | ... | 140 |
| .. | Oats | Spurrey | Not quite full | 141 |
| . | $\frac{1}{2}$ oz. of oats | ... | ... | 142 |
| ... | Oats | ... | ... | 143 |

25 PIGEONS,

| No. | Date. | Hour. | Weather. | Place and Occasion. | Roots. | Leaves. |
|-----|-------|------------|----------|--------------------------------------|--------|---------|
| 144 | 27th | 2 p.m. | Good | Sunnybraes, on tree | ... | ... |
| 145 | ... | .. | ... | ... | ... | ... |
| 146 | 28th | 11.30 a.m. | Good | Upper Pratis, on barley- field | ... | ... |
| 147 | 28th | 12 noon | Good | Upper Pratis, on barley- field | ... | ... |

Food.—Grain—chiefly barley and oats—occurs in 19 of the 25 birds shot during this month. Two of the six remaining birds had empty crops, but examination of the gizzards of these showed that they also had been on grain. Accordingly, 21 of the 25 birds have fed on grain. In two cases a few spurrey-seeds were mixed with the grain.

Change of Diet.—The record for August is the very converse of that for July. In July the leaf column was full and the grain column empty, whereas now the grain column is full and the leaf column empty, at least after the 6th of August, when the change to grain took place. Green food, chiefly in the form of turnip and clover leaf, dominated last month; there is now a complete change, and quite a rush from grass leaf to grain. Seeds of weeds, such as spurrey and mouse-ear chickweed, and fruits of elm are no longer in demand: grain taken from the farmer's crop replaces these. The pigeon, in fact, ceases to act as weed-destroyer now, for he is making use of grain instead of weeds.

AUGUST 1894.—CONTINUED.

| Flowers. | Grain Fruits. | Other Fruits and Seeds. | Remarks. | No. |
|----------|-------------------|-------------------------|---|-----|
| ... | Oats, green | ... | ... | 144 |
| ... | do. | ... | ... | 145 |
| ... | Wheat and oat | ... | Not at all full | 146 |
| ... | 3 or 4 oat-grains | ... | Almost empty: gizzard almost empty; contained remnants of grain | 147 |

Stones for Gizzard.—Pigeons 130 and 132 were of special interest. In the crops of these birds quartz grains were found, probably on their way to the gizzard, to be used for grinding grain. Now there is more grain to grind; and now the pigeon is specially equipping himself for this extra work.

Wild Cherry-stones in Gizzard.—In none of the crops examined were wild cherries found, yet in the gizzards of two birds (124 and 126) the stony parts of these fruits were found—11 in one case and 5 in another. It is interesting to inquire how these stones are disposed of. Is the gizzard sufficiently powerful to crush them up; are they used as part of the grinding machinery; are they digested; are they vomited or otherwise discharged from the body?

21 PIGEONS,

| No. | Date. | Hour. | Weather. | Place and Occasion. | Roots. | Leaves. |
|-----|-------|------------|----------------|--------------------------|--------|---------------------------|
| 148 | 3d | 3 p.m. | Good | Upper Pratis, on tree | .. | ... |
| 149 | ... | ... | ... | ... | ... | ... |
| 150 | 5th | 3.45 p.m. | Good | Lundin Wood, on tree | ... | A few alsike leaves |
| 151 | 5th | 7 p.m. | Very wet | Nether Pratis, on barley | ... | ... |
| 152 | 10th | 3.30 p.m. | Good | Nether Pratis | ... | .. |
| 153 | ... | ... | ... | ... | ... | ... |
| 154 | 12th | 6.30 p.m. | Very fine | Lundin | ... | ... |
| 155 | 14th | 8 a.m. | Very fine | Lundin Wood, on tree | .. | ... |
| 156 | 17th | 10.15 a.m. | Fine, but dull | Balcormo, on grass | ... | ... |
| 157 | 17th | 11 a.m. | Fine, but dull | Pilmuir, on oat-field | .. | White clover |
| 158 | 18th | 2 p.m. | Lovely day | Annfield, flying | ... | A few white clover leaves |
| 159 | 20th | 4 p.m. | Good | Lundin Wood, on tree | ... | ... |
| 160 | 21st | 8 a.m. | Good | Lundin Wood, on tree | ... | ... |
| 161 | ... | ... | ... | ... | ... | ... |
| 162 | 25th | 2.30 p.m. | Good | Pilmuir, flying | ... | ... |
| 163 | ... | ... | .. | ... | ... | ... |
| 164 | .. | ... | ... | .. | .. | ... |
| 165 | 25th | 3 p.m. | Good | Aithernie Den, on tree | .. | ... |
| 166 | 28th | 3 p.m. | Very warm | Pilmuir, on grass | ... | ... |
| 167 | .. | ... | ... | ... | ... | ... |
| 168 | 28th | 5 p.m. | Very warm | Pilmuir, on barley-field | ... | A little white clover |

Food.—Every bird examined during this month had grain : if the crop happened to be empty, then grain, or traces of it, was found in the gizzard. A touch of clover-leaf, dock-fruits, and cruciferous seeds was occasionally met with. In one pigeon (No. 162) cherry-stones were again found in the gizzard.

Pigeon's Milk.—In quite a number of the birds the crop was swollen and very glandular.

SEPTEMBER 1894.

| Flowers. | Grain Fruits. | Other Fruits and Seeds. | Remarks. | No. |
|----------|---|----------------------------|--|-----|
| ... | ... | ... | Empty: gizzard full of oat-grain | 148 |
| ... | ... | ... | Empty: gizzard full of wheat-grain | 149 |
| ... | Packed: barley | ... | Crop glandular | 150 |
| ... | Not all full: barley | ... | The barley-grains were green. Gizzard full of the green barley. Crop glandular | 151 |
| ... | Full: green oats | ... | ... | 152 |
| ... | ... | ... | Empty: gizzard almost full of grain-husk | 153 |
| .. | Barley | ... | ... | 154 |
| ... | Barley and wheat | ... | Crop very glandular | 155 |
| ... | .. | ... | Empty: gizzard contained remnants of barley-grain | 156 |
| ... | Oat | Dock and cruciferous seeds | Crop very glandular and swollen; contained pieces of earthworm | 157 |
| .. | 20 barley-corns | ... | ... | 158 |
| .. | Barley and wheat, not at all full | A few cruciferous seeds | Crop very glandular | 159 |
| ... | Half full of rye | ... | Crop very glandular: milk coagulated, with cheesy odour | 160 |
| ... | Oats | Dock and cruciferous seeds | ... | 161 |
| ... | ... | ... | Empty: gizzard contains 5 stones of wild cherry and traces of grain | 162 |
| .. | Mixed barley, wheat, and oats | .. | Crop very glandular: milk coagulated, with cheesy odour | 163 |
| ... | 20 oat-grains | .. | ... | 164 |
| ... | A few wheat grains | ... | Almost empty: gizzard contained wheat | 165 |
| ... | ... | .. | ... | 166 |
| ... | ... | ... | Empty: gizzard contained grain-husk | 167 |
| .. | Half full: equal amounts of barley and oats | ... | ... | 167 |
| ... | Chiefly barley | ... | ... | 168 |

Several ounces of crop-secretion—"pigeon's milk" it is called—were bottled and preserved. Curiously enough, the milk was found more abundantly and more frequently in the male birds than in the female.

Earthworms.—Pieces of earthworm were found in the crop of a male pigeon (No. 157).

24 PIGEONS,

| No. | Date. | Hour. | Weather. | Place and Occasion. | Roots. | Leaves. |
|-----|-------|------------|---------------|-----------------------------|--------|---------|
| 169 | 1st | 2 p.m. | Extra fine | Pilmuir, flying | ... | ... |
| 170 | ... | ... | ... | ... | .. | .. |
| 171 | 5th | 3 p.m. | Good | Upper Pratis, flying | ... | .. |
| 172 | ... | ... | ... | ... | .. | ... |
| 173 | ... | ... | ... | ... | ... | ... |
| 174 | 8th | 3 p.m. | Good | Upper Pratis, flying | ... | ... |
| 175 | ... | ... | ... | ... | ... | ... |
| 176 | 9th | 3 p.m. | Good | Nether Pratis, on oat-field | ... | .. |
| 177 | 15th | 12 noon | Cold and fine | Nether Pratis, flying | ... | ... |
| 178 | 15th | 3 p.m. | Cold and fine | Nether Pratis, flying | ... | ... |
| 179 | ... | ... | ... | ... | .. | ... |
| 180 | ... | ... | ... | ... | .. | .. |
| 181 | 16th | 3 p.m. | Cold and fine | Greenside, flying | ... | ... |
| 182 | 18th | 11.30 a.m. | Very fine | Sunnybraes, flying | ... | ... |
| 183 | 18th | 3 p.m. | Very fine | Annfield, on barley-field | ... | ... |
| 184 | 22d | 11.30 a.m. | Very fine | Hatton, flying | ... | . |
| 185 | 24th | 3 p.m. | Very wet | Annfield, on barley-field | ... | ... |
| 186 | 25th | 4 p.m. | Good | Pilmuir, flying | .. | ... |
| 187 | ... | ... | ... | ... | .. | ... |
| 188 | ... | ... | ... | ... | .. | .. |
| 189 | 25th | 5 p.m. | Good | Lundin, on tree | .. | .. |
| 190 | 29th | 1 p.m. | Lovely day | Upper Pratis, on oat-field | .. | ... |
| 191 | 29th | 3 p.m. | Lovely day | Upper Pratis, on oat-field | ... | ... |
| 192 | ... | ... | ... | ... | ... | ... |

Food.—A glance at the record for the month shows all the columns empty except grain and seeds. Two of the pigeon-crops were empty, and the remaining twenty-two crops were usually packed with or full of grain. The grain was supplemented by—Beech-nuts 67 in number, beans 51, tares 6, peas 4; total, 128 seeds.

Grain—chiefly barley—and 128 seeds were accordingly all the food found in the crops of the 24 pigeons for the month.

OCTOBER 1894.

| Flowers. | Grain Fruits. | Other Fruits and Seeds. | Remarks. | No. |
|----------|---|---------------------------|---|-----|
| ... | A little barley | ... | Almost empty | 169 |
| ... | Full: wheat | ... | ... | 170 |
| ... | Half-full: barley | ... | ... | 171 |
| ... | Full: barley | ... | ... | 172 |
| ... | do. | .. | ... | 173 |
| ... | Full: oats and very little barley | ... | ... | 174 |
| ... | Wheat and barley | ... | ... | 175 |
| ... | Wheat | 12 beans, 6 tares, 4 peas | ... | 176 |
| ... | Very little: barley and wheat | ... | ... | 177 |
| ... | Full: barley | 6 beans | ... | 178 |
| ... | A little barley | ... | Crop glandular | 179 |
| ... | Very little barley | ... | ... | 180 |
| ... | ... | ... | Crop empty: gizzard contained a few grain-husks | 181 |
| .. | Oats | 8 beech-nuts | ... | 182 |
| ... | Half-full: wheat and very little barley | ... | Heart tuberculous | 183 |
| .. | Barley | ... | .. | 184 |
| ... | Packed: barley | 21 beans | ... | 185 |
| ... | Packed: barley | ... | ... | 186 |
| ... | do. | ... | ... | 187 |
| ... | do. | ... | ... | 188 |
| ... | Barley | 21 beech-nuts | Filled with the mixture | 189 |
| ... | ... | ... | Crop empty: gizzard contained grain-husks | 190 |
| .. | Not full: barley | 12 beans | ... | 191 |
| ... | Twelve barley-grains | 38 beech-nuts | Crop glandular | 192 |

Gizzard Contents.—The gizzards of the two birds with empty crops contained traces of grain, and of course the grinding-stones.

Beech-nuts.—A new article of diet—the beech-nut—is beginning to be consumed. The first pigeon with the nuts (No. 182) was shot on the 18th, and contained 8 nuts; the second (No. 189) was shot on the 25th, and contained 21 nuts; the third (No. 192) was shot on the 29th, and contained 38 nuts.

21 PIGEONS.

| No. | Date. | Hour. | Weather. | Place and Occasion. | Roots. | Leaves. |
|-----|-------|------------|----------------|------------------------------|--------|---------|
| 193 | 5th | 3 p.m. | Good | Lundin, flying | ... | .. |
| 194 | ... | ... | ... | ... | ... | . |
| 195 | 9th | 11 a.m. | Dull and rain | Lundin, on tree | ... | . |
| 196 | ... | ... | ... | ... | ... | . |
| 197 | 12th | 12 noon | Good | Pilmuir, on bean-field | ... | . |
| 198 | 12th | 3 p.m. | Good | Hatton, on tree | . | |
| 199 | 14th | 11 a.m. | Very fine | Lundin, on tree | ... | ... |
| 200 | ... | ... | ... | ... | ... | . |
| 201 | 14th | 12 noon | Very fine | Lundin, on tree | ... | . |
| 202 | ... | ... | ... | ... | ... | ... |
| 203 | 15th | 4 p.m. | Frosty, bright | Annfield, on barley-field | ... | ... |
| 204 | 19th | 2 p.m. | Very fine | Pilmuir, on bean-field | .. | .. |
| 205 | ... | ... | ... | ... | ... | .. |
| 206 | 19th | 3.30 p.m. | Very fine | Pilmuir, on bean-field | ... | .. |
| 207 | .. | ... | ... | ... | ... | ... |
| 208 | 23d | 3.30 p.m. | Frosty, fine | Letham, on tree | ... | ... |
| 209 | ... | ... | ... | ... | ... | ... |
| 210 | 24th | 10.30 a.m. | Frosty, fine | Upper Pratis, on corn-field | ... | ... |
| 211 | 24th | 11 a.m. | Frosty, fine | Upper Pratis, on oat-stubble | ... | .. |
| 212 | 28th | 12 noon | Good | Nether Pratis, on bean-field | ... | . |
| 213 | ... | ... | ... | ... | ... | .. |

Food.—The record for this month shows all the food columns empty except two—the cereal grain column and the fruit column. It is immediately evident that the birds are now as often on other seeds and fruits as on grain. The grain found was always barley, except in No. 198, which was full of wheat. The other fruits and seeds found were beech-nuts, wild cherries, haws,

NOVEMBER 1894.

| Flowers. | Grain Fruits. | Other Fruits and Seeds. | Remarks. | No. |
|----------|-------------------------------|-------------------------------------|---|-----|
| ... | Barley | 12 beech-nuts | Not full | 193 |
| ... | ... | 102 beech-nuts and 3 beans | ... | 194 |
| ... | ... | 13 beech-nuts | ... | 195 |
| ... | .. | 11 beans | ... | 196 |
| ... | ... | ... | Empty: gizzard contained grain-husks | 197 |
| ... | Full: wheat | ... | ... | 198 |
| ... | Half-full: barley | Full: beech-nuts | ... | 199 |
| ... | ... | ... | ... | 200 |
| ... | Half-full: barley | ... | ... | 201 |
| ... | Nearly empty: a little barley | 1 beech-nut | ... | 202 |
| ... | Half-full: barley | ... | ... | 203 |
| ... | ... | 6 haws and 3 beans | ... | 204 |
| .. | Full: barley | 4 sprouted tares | ... | 205 |
| ... | ... | ... | Empty: gizzard contained grinding-stones only | 206 |
| .. | Full: barley | ... | .. | 207 |
| ... | Barley | Beech-nuts equal in bulk to barley | ... | 208 |
| ... | Full: barley | ... | .. | 209 |
| .. | Nearly empty: a little barley | ... | ... | 210 |
| .. | . | | Empty: gizzard also empty, save the grinding-stones | 211 |
| . | ... | Mixed maize and stones of drupe- | Had been taking an artificial food mixture | 212 |
| .. | ... | Contains nothing but 4 drupe-stones | ... | 213 |

beans, tares, and maize. The maize was evidently got from an artificial food mixture. Barley and beech-nuts were the chief foods for this month.

Beech-nuts.—These nuts occurred in 7 of the 21 birds. The crop of pigeon 194 contained 102 beech-nuts and 3 beans.

12 PIGEONS

| No. | Date. | Hour. | Weather. | Place and Occasion. | Roots. | Leaves. |
|-----|-------|-----------|---------------|------------------------|---------------------|------------------|
| 214 | 1st | 3 p.m. | Lovely day | Lundin, on tree | ... | ... |
| 215 | 6th | 3 p.m. | Frost and fog | Nether Pratis, on tree | ... | ... |
| 216 | ... | ... | ... | .. | ... | ... |
| 217 | 10th | 2 p.m. | Mild and dull | Hatton, flying | Potato | ... |
| 218 | ... | ... | ... | ... | ... | ... |
| 219 | 18th | 4 p.m. | Mild and fine | Lundin, on tree | Full: potato | ... |
| 220 | ... | ... | ... | ... | Well filled: potato | ... |
| 221 | ... | ... | ... | ... | Full: potato | ... |
| 222 | ... | ... | .. | ... | Potato | Clover and swede |
| 223 | 21st | 4 p.m. | Lovely day | Lundin Wood, on tree | Potato | ... |
| 224 | 22d | 3.45 p.m. | Great gale | Lundin Wood, on tree | ... | ... |
| 225 | 28th | 3.30 p.m. | Very stormy | Lundin Wood, on tree | Potato | Swede |

Food.—A glance at the record shows that the columns filled this month are not, as before, grain and other fruits, but grain and roots (potatoes).

Potatoes.—The potato attack was first noticed on the 10th, and from that date onwards it was fairly continuous. In one case, at any rate (No. 219), the potato had been refuse gathered from the fields; this was inferred from the diseased condition of the potato and the very small size.

DECEMBER 1894.

| Flowers. | Grain Fruits. | Other Fruits and Seeds. | Remarks. | No. |
|----------|----------------------------------|-------------------------|---|-----|
| ... | ... | Full : beans | ... | 214 |
| ... | Full : oats with a little barley | ... | ... | 215 |
| ... | Packed : oats | ... | ... | 216 |
| ... | A little barley | .. | ... | 217 |
| ... | Packed : sprouted barley | ... | ... | 218 |
| ... | ... | ... | Potato, somewhat diseased : probably picked from fields | 219 |
| ... | Very little barley | ... | ... | 220 |
| ... | ... | ... | ... | 221 |
| ... | Barley and oats | Beech-nuts | ... | 222 |
| ... | Barley | ... | ... | 223 |
| ... | ... | Packed : beech-nuts | ... | 224 |
| ... | ... | ... | ... | 225 |

Chief Diet.—Grain and potato formed the chief diet for the month. In several cases the grain had sprouted before the bird got it, and it is reasonable to infer that this grain may have been got from stubble-fields. The only additions to grain and potato were touches of clover and swede leaves in two birds, beans in one bird, and beech-nuts in two.

Quantity of Food.—None of the crops were empty ; indeed, as a rule, the birds were packed, or specially well filled.

21 PIGEONS,

| No. | Date. | Hour. | Weather. | Place and Occasion. | Roots. | Leaves. |
|-----|-------|------------|--------------------------|-------------------------|--------------------|---|
| 226 | 3d | 3 p.m. | Very fine, hard frost | Letham, flying | ... | Full: turnip-shaw |
| 227 | ... | ... | ... | ... | ... | Full: turnip |
| 228 | ... | ... | ... | ... | ... | Not at all full: turnip |
| 229 | ... | ... | ... | ... | Potato | Packed: turnip |
| 230 | ... | ... | ... | ... | ... | Full: turnip |
| 231 | 9th | 11.30 a.m. | Hard frost | Lundin, on tree | ... | Not full: turnip |
| 232 | 14th | 4 p.m. | Thaw | Lundin, on tree | .. | Full: turnip |
| 233 | .. | ... | ... | ... | A little potato | do. |
| 234 | ... | ... | ... | ... | ... | Full: turnip and white clover; more clover |
| 235 | ... | ... | ... | ... | ... | Packed: turnip |
| 236 | 19th | 3 p.m. | Hard frost | Montrave, flying | ... | Packed: turnip |
| 237 | 21st | 4 p.m. | Hard frost | Montrave, flying | ... | Packed: turnip |
| 238 | .. | ... | ... | ... | ... | do. |
| 239 | ... | .. | ... | ... | A little potato | Full: turnip |
| 240 | .. | .. | ... | ... | Full: potato | ... |
| 241 | 21st | 4.30 p.m. | Hard frost | Lundin, on tree | Very little potato | Full: turnip |
| 242 | ... | ... | ... | ... | Full: potato | ... |
| 243 | ... | .. | ... | ... | do. | .. |
| 244 | 26th | 4.30 p.m. | Very keen frost | Lundin Wood, on tree | ... | Packed: turnip |
| 245 | 29th | 1 p.m. | Very keen frost | Lundin, on tree | ... | One or two pieces of turnip-leaf |
| 246 | 30th | 4.30 p.m. | Very keen frost | Lundin, on tree | ... | Not at all full: turnip |

Food.—The leaf column of the record for this month is alone full—indeed eighteen of the twenty-one pigeons examined took turnip-top. The crops of the other three pigeons contained nothing but potato. Occasionally there was a little potato with the turnip-shaw—in one case a few beech-nuts, and in another a good deal of white clover.

Change of Diet.—Last month potato and grain were chiefly used; now the potato is much less frequently taken, grain not at all, and turnip-top is the staple food. The long run on grain

JANUARY 1895.

| Flowers. | Grain Fruits. | Other Fruits and Seeds. | Remarks. | No. |
|----------|---------------|-------------------------|-------------------|-----|
| ... | ... | ... | ... | 226 |
| ... | ... | ... | ... | 227 |
| ... | ... | ... | ... | 228 |
| ... | ... | ... | ... | 229 |
| ... | ... | ... | ... | 230 |
| ... | ... | A few beech-nuts | ... | 231 |
| ... | ... | ... | ... | 232 |
| ... | ... | ... | ... | 233 |
| ... | ... | ... | ... | 234 |
| ... | ... | ... | ... | 235 |
| ... | ... | ... | ... | 236 |
| ... | ... | ... | ... | 237 |
| ... | ... | ... | ... | 238 |
| ... | ... | ... | ... | 239 |
| ... | ... | ... | ... | 240 |
| ... | . | ... | ... | 241 |
| ... | . | ... | ... | 242 |
| ... | . | .. | ... | 243 |
| ... | ... | .. | ... | 244 |
| ... | ... | ... | Practically empty | 245 |
| ... | ... | ... | ... | 246 |

which commenced in August and continued through September, October, and November, came to a sudden end about 22d December, and not a single corn was found in any bird examined between that date and the end of January.

Quantity of Food.—The crops of the birds were, as a rule, remarkably well filled, and often quite packed—gizzard as well as crop. One bird was practically empty.

19 PIGEONS

| No. | Date. | Hour. | Weather. | Place and Occasion. | Roots. | Leaves. |
|-----|-------|------------|------------|--------------------------|-----------------------|---------------------|
| 247 | 9th | 4 p.m. | Hard frost | Montrave, flying | Some pieces of turnip | Full : turnip |
| 248 | 11th | 12.30 p.m. | Hard frost | Upper Pratis, on turnips | ... | .. |
| 249 | ... | ... | ... | ... | ... | ... |
| 250 | 11th | 4 p.m. | Hard frost | Montrave, flying | ... | Full : turnip |
| 251 | ... | ... | ... | ... | Some pieces of turnip | do. |
| 252 | 16th | 5 p.m. | Hard frost | Lundin Wood, on tree | Pieces of potato | Full : turnip |
| 253 | ... | ... | ... | ... | do. | do. |
| 254 | 16th | 5.30 p.m. | Hard frost | Lundin Wood, on tree | Potato | Half-full : turnip |
| 255 | ... | ... | ... | ... | do. | Full : turnip |
| 256 | 20th | 5 p.m. | Hard frost | Montrave, flying | ... | Packed : turnip |
| 257 | ... | ... | ... | ... | ... | do. |
| 258 | ... | ... | ... | ... | ... | do. |
| 259 | ... | ... | ... | ... | ... | do. |
| 260 | 27th | 5.30 p.m. | Hard frost | Lundin, on tree | Full : potato | ... |
| 261 | ... | ... | ... | ... | do. | ... |
| 262 | ... | ... | ... | ... | do. | ... |
| 263 | .. | ... | ... | ... | ... | Full : red clover |
| 264 | 28th | 6 p.m. | Hard frost | Lundin, on tree | Full : potato | ... |
| 265 | ... | ... | ... | ... | ... | Packed : red clover |

Food.—The food used is practically the same as in January—that is, turnip-top and potato. Potato, however, is more in evidence now than then. One bird (No. 248) had managed to secure barley sufficient to half fill its crop.

FEBRUARY 1895.

| Flowers. | Grain Fruits. | Other Fruits and Seeds. | Remarks. | No. |
|----------|-------------------|----------------------------|----------------------------|-----|
| ... | ... | ... | ... | 247 |
| ... | Half full: barley | ... | ... | 248 |
| ... | ... | ... | Crop empty ; gizzard empty | 249 |
| ... | ... | ... | ... | 250 |
| ... | ... | ... | ... | 251 |
| ... | ... | ... | ... | 252 |
| ... | ... | ... | ... | 253 |
| ... | ... | ... | ... | 254 |
| ... | ... | ... | .. | 255 |
| ... | ... | ... | ... | 256 |
| ... | ... | ... | ... | 257 |
| ... | ... | ... | ... | 258 |
| ... | ... | .. | ... | 259 |
| ... | ... | ... | ... | 260 |
| ... | ... | .. | ... | 261 |
| ... | .. | ... | .. | 262 |
| ... | .. | .. | .. | 263 |
| ... | ... | ... | ... | 264 |
| ... | ... | ... | ... | 265 |

Change of Diet.—In pigeon No. 263, shot on the 27th, the change to red clover is commencing. This return to clover is seen in full action during March.

Quantity.—As in January so in February, the crops of the birds are specially well filled. One bird was quite empty.

ROOKS.

SECTION 1.—NUMBER.

The number of rooks examined during the twelvemonth commencing 1st March 1894 was 355. The following table shows the number of birds shot per month, and the number of empty birds—*i.e.*, birds having no food whatever either in crop or gizzard:—

ROOKS EXAMINED DURING TWELVE MONTHS FROM BEGINNING OF
MARCH 1894 TO END OF FEBRUARY 1895.

| | 1894. | | | | | | | | | | | 1895. | | Total. |
|---------------------|-------|--------|------|-------|-------|------|-------|------|------|------|------|-------|-----|--------|
| | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | | |
| Number examined . . | 27 | 25 | 37 | 29 | 24 | 30 | 31 | 30 | 28 | 22 | 35 | 37 | 355 | |
| Number empty . . | 0 | 1 | 4 | 1 | 3 | 0 | 3 | 0 | 3 | 1 | 1 | 2 | 19 | |

The number of birds with gizzard contents is 355 minus 19 empties—that is, 336. Thus the conclusions arrived at are deduced from the testimony of 336 rook-gizzards. In these the number of food and other items counted is 502. It is accordingly plain that rooks use mixed diet, otherwise this number ought to have been 336, not 502.

SECTION 2.—THE STAPLE FOODS.

All the contents of rook-gizzards may conveniently be arranged in four groups: 1, Insects and grubs; 2, Roots (potatoes); 3, Cereal grains and grain husks; 4, Miscellaneous matter.

Comparing now the staple foods of rook and pigeon, we note at once that roots and cereal grains are common to both birds, but that the animal kingdom supplies insects, grubs, and worms, which may be regarded as taking the place of the leaves and flowers used by pigeons. This insectivorous feature is a very pronounced and striking character of the bird. If to this is added the miscellaneous nature of much of the food consumed, we have in broad outline the differences between rook and pigeon from the dietetic point of view. To show this comparison clearly, let us place all the food-stuffs of both birds side by side:—

Rook.

1. Insects and grubs.
2. Roots.
3. Cereal grain and husks.
4. Miscellaneous.

Pigeon.

- Leaves and flowers.
- Roots.
- Cereal grain.
- Various fruits and seed.

It is desirable to point out here that the crop of the rook is a very small affair, only used at certain times for holding a few grubs or worms to feed the young. On the other hand, the pigeon-crop is a large capacious bag regularly used for storing away much food till wanted. The rook lives, so to say, from hand to mouth; the pigeon makes provision when it can, and stores away for the immediate future: the one is a miscellaneous feeder, always picking and getting; the other has specific wants, which it satisfies, and much more than satisfies, for when opportunity offers it not only fills up the gizzard, but in addition packs and overpacks the crop.

The examination of rook food, taken as it must be from a gizzard in which it is rapidly changed by digestive processes into an almost unrecognisable state, is often a matter of extreme difficulty and delicacy, whereas food from a pigeon-crop is almost as fresh and quite as easy to identify as if newly swallowed.

SECTION 3.—RELATIVE IMPORTANCE OF THE FOODS.

Each food-stuff in the rook is found to occur a certain number of times during the course of a year, and it is certainly quite fair to take this number as measure of the importance of each kind. Here are the figures actually found, and for purposes of comparison we place alongside the corresponding percentages for pigeon-food:—

| FOOD-STUFF. | ROOK. | | PIGEON. | |
|---|---------------------|------------|----------|---------------------|
| | No. of times taken. | Per cent | Per cent | No. of times taken. |
| Cereal grain and husk | 290 | 58 | 33 | |
| Insects, grubs, &c. | 116 | 23 | 0 | |
| Miscellaneous | 60 | 12 | 0 | |
| Roots | 36 | 7 | 8·5 | |
| Leaves | 0 | 0 | 27·5 | |
| Flowers | 0 | 0 | 8 | |
| Fruits and seeds, not cereals | 0 | 0 | 23 | |
| | <u>502</u> | <u>100</u> | | <u>100</u> |

These figures show that at least *three-fourths of rook-food* (81 per cent) is *cereal grain and husk, with insect and grub*; also that *grain and husk are at least twice as frequently met with as insects and grubs*. This is the essence of the evidence extracted from the gizzards of 336 rooks shot at intervals all the year round: Grain and husks is above everything the food of the rook; grain and its husk, from whatever sources derived, is more frequently found than anything else. Here it is worth while asking ourselves the point-blank question, Do rooks use grain and its husks more frequently than pigeons? The definite answer is contained in the above figures, and is to the

effect that grain and husk are oftener met with in rooks than in graminivorous pigeons in the proportion of 58 to 33; cereal grain and husk are not only more common than cereal grains in pigeons, but in frequency they exceed all the cereal grains, all the fruits, and all the seeds found in pigeons when put together. Surely this is a thing exceeding strange, and surely capable of yielding for our benefit some hitherto untaught lessons, for hitherto the rook has been regarded simply as an insectivore, not as a grain consumer. What these lessons are we now proceed to show.

SECTION 4.—FOOD SOURCES.

Grain and Husks.—Let us first deal with the cereal grain and husks, which forms 58 per cent of the total food of rooks. Two sources of supply are usually free and open to the bird, and these he as freely uses: they are the partially spent grain and husks in dung, as also the farmer's grain *par excellence*—that which he sows, and that which he also reaps, as well as that which is left behind on the stubble-field. It may be considered important to answer precisely how often the rook plies the dung, how often he attacks the farmer's grain; but this question cannot be definitely dealt with, for, as we have already explained, the grain in the gizzard is met with so frequently broken down and disorganised, that we can at times merely state it as grain and husk in general, without specifying source or specific kind. It is true that we can often recognise the grain as got from dung, and when we certainly can we state it so; it is equally true that on many other occasions we can as definitely recognise it as derived from the farmer's sowing or from his crop—his barley, his oats, his wheat, his rye. But the how much from dung question is, after all, not of great practical import, for is not the broad fact clear that grain is the staple of staple foods for rooks? Lusting for it as these birds do, we may rest assured that the rook will attack and prey freely upon the farmer's grain whenever and wherever favourable opportunity is presented: whether soft or hard, whether sprouted or unsprouted, whether ripe or unripe, whether in dung or on stubble-field, is of little moment to the rook. The great lesson to be learned here is this, that the rook must often—very often—be on the hunt for grain: accordingly, among his favoured haunts for food are the dunghill, the dung-dropping, or the dunged field. It is not difficult to perceive that we must often fail to catch and to appreciate the true motives of the action of the bird, if we are under dominion of the fancy that he seeks not after grain. When we see rooks on turnip or on potato fields we must not immediately assume that these crops are to go into the

rooks as food; we must rather remember the 58 per cent of grain, and consider that, after all, the bird may be but seeking the partially spent grains which form one part of dung. It must not be forgotten, however, that search for grain in dung must often entail much waste of the farmer's crop from uprootal and other causes; and in this connection it is worth while pointing out that the rook wants, if he can get it, some dainty morsel to his grain—his bit of insect or his insect grub. With this object—to get grain and insect—he probes the ground, digs and upturns it, uproots the plants; hence the injury to dunged crops is often extensive, often severe, and hence the use of scarecrow as preventive measure.

Insects and Grubs.—The insects and grubs from rook-gizzards identified by Mr Mosley of Huddersfield were these:—

Many kinds of small ground-beetles (*Geodophaga*).
 Wireworm grubs.
 Daddy longlegs grubs (*Tipula*).
 Carabus grubs.
 Miana grubs.
 Hyalophasia grubs.
 Turnip-moth grubs.

The ground-beetles (*Geodophaga*) being of predatory habit, are considered beneficial to agriculture, and when destroying these—as is done on a fairly large scale—the rooks must be regarded as acting in opposition to the interests of the farmer. When killing and taking grub, on the other hand, the birds may fairly be looked upon in the light of farmers' friends and benefactors.

We now proceed to square accounts with the rook on the score of insects and grubs. We must appeal to the figures found: these will, at any rate, yield us the approximate truth. We find in 336 gizzards examined—

Adult insects taken 75 times during the year.
 Grubs taken 26 times during the year.

The insects destroyed were chiefly useful ground-beetles, and the extent to which this was done can scarcely be considered as counterbalanced by the grub consumpt. Alongside insects and grubs we place the following:—

| | | |
|------------------|-------|-----------|
| Earthworms | taken | 12 times. |
| Earthworm's eggs | " | 1 " |
| Molluscs | " | 2 " |

Roots (Potatoes).—The record of our investigations shows that in the Fife district the frequency with which this kind of food is taken is expressed by the figure 7 per cent. In the 336

gizzards examined potato was met with 36 times, which means that potato occurred in about 10 per cent of the birds. This percentage for potato is not too low, for, however much broken up, the potato is easily and certainly identified by its characteristic starch-grains. Potato was taken by the birds in early year from the sets, and in late year from the pits. It may easily be that potato is more frequently consumed in other districts, but this can only be determined by exact and extended observations carried out on rooks in other parts of the country. An observation on this head is recorded in the notes to the record for July.

Miscellaneous Contents.—Under this head are grouped together a very heterogeneous collection of stuffs, which we now proceed to enumerate:—

| | No. of times taken during the year. |
|---|--|
| Artificial food-stuffs | 19 |
| Dung | 11 |
| Almost unrecognisable matter (cakes, &c.) | 9 |
| Earthy matter and mud | 5 |
| Sea-shells | 4 |
| Ashy matter | 4 |
| Bone-meal | 3 |
| Shell-sand | 2 |
| Horny substance | 1 |
| Grass-leaf | 1 |
| Flesh | 1 |
| Total | <u>60</u> |

Amongst these items artificial food-stuffs are most frequent; these were taken at least 19 times, and probably 9 times more (in the shape of cakes, &c.)—this points out the thieving propensity of the rook. The dung takes given were those in which the gizzard contents were indubitably dung—recognised as such by colour and by odour—and it is to be clearly understood that this figure 11 is in no sense whatever to be taken as an indication of the frequency of dung in rooks. The bone-meal item is interesting, as it shows that even the farmer's artificial manures are not quite safe from rook attack.

SECTION 5.—TOTAL INJURIES AND BENEFITS.

The only crops used as food by rooks are—

| | |
|-----------------|--------------------------|
| Grain | Barley, oat, wheat, rye. |
| Roots | Potato. |

Compared with the pigeon, we may safely regard the rook as equally destructive to grain crops, and about equally so to roots (potatoes), since roots are taken by pigeons 8·5 per cent

times, by rooks 7 per cent times. One advantage of the rook is that he does not interfere at all with leaf crops such as clover; seeds other than cereals he lets severely alone, at least we have found no seed or fruit other than cereal in the gizzards observed by us. As a weed-destroyer, however, the pigeon has it.

So far as insect destruction is concerned, we find, as already explained, that the rook is no unmitigated blessing; for, although he is a powerful grub-destroyer, he is to a larger extent a predaceous ground-beetle-killer. At the same time, we have to bear in mind that the mere getting of the insects may and often does sad damage to the young turnip and potato crops. On old pasture, however, it may well be that the rook does much good, for there, insect-hunting does little damage to the grass and clover.

Taken altogether, the rook has almost no claim to agricultural regard: his thieveries and rogueries look very black, for do we not catch him 19 times at artificial foods and 9 times more at cakes and suchlike, let alone his destruction of our crops when using them as food or when hunting in them for his favourite insects? There is, indeed, not very much to choose between the thieving rook and the gentle dove.

SECTION 6.—FOODS CONSUMED EACH MONTH.

Now we come to consider the facts and figures as they present themselves for each month of a year, and we do this with the view of making ourselves precisely acquainted with the *when* as well as the *where* of the points of attack. The corresponding table of monthly food consumpt for pigeons is given on p. 29. The highest numbers in each month are in thick type:—

CONTENTS OF ROOKS TO SHOW WHEN AND HOW OFTEN
VARIOUS FOODS ARE USED.

| | 1894. | | | | | | | | | | | 1895. | | Total. |
|---------------------------|-------|-------|-----|-------|-------|------|-------|------|------|------|------|-------|-----|--------|
| | Mar. | April | May | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | | |
| Insects, grubs, &c. . . . | 5 | 3 | 21 | 22 | 18 | 23 | 10 | 6 | 2 | 1 | 2 | 3 | 116 | |
| Roots (potatoes) . . . | 1 | 0 | 11 | 6 | 0 | 2 | 0 | 0 | 0 | 10 | 6 | 0 | 36 | |
| Grain and husk . . . | 18 | 22 | 28 | 15 | 18 | 26 | 26 | 30 | 25 | 20 | 34 | 33 | 290 | |
| Miscellaneous . . . | 11 | 9 | 5 | 9 | 8 | 5 | 2 | 1 | 2 | 2 | 1 | 5 | 60 | |
| Total . . . | 35 | 34 | 65 | 52 | 39 | 56 | 38 | 37 | 29 | 33 | 43 | 41 | 502 | |

Insects and Grubs.—Looking along the first horizontal line of
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this table, which shows the insect foods, we notice that this kind of diet is most frequently taken during May, June, July, August, and that the figures for insect food-stuffs are highest of all for the months of June and July: during these two months the rooks were revelling in insect food. What pigeons were doing at the same time may be shown thus:—

| | | | Rooks- | Pigeons |
|------|---|---|----------|------------------------|
| June | . | . | Insects. | Various seeds, &c. |
| July | . | . | Insects. | Leaves of clovers, &c. |

Potatoes.—Inspection of the root group of foods—potatoes—shows that a rush, never very strong, took place in this direction only on two occasions—in May and in December; on the sets in May, on the pits and waste potatoes in the fields in December. The May attack continued into June, and that of December into January. The pigeons took no potatoes in May, but, like the rooks, commenced to use them in December, and continued to do so during January and February.

Observe that the May-June attack is coincident with extra insect consumption: this coincidence might cheat us into supposing that the bait which served to draw the rooks to the potato-fields was the insects there. Such a supposition is, however, inconsistent with the record, which shows that the insects did not entice to the potatoes, since potatoes and insects occur not together, but in totally different birds.

Cereal Grains and Husks.—Turning next to the line for cereal grains and husks, we are at once struck by the exceeding frequency of this kind of food. Grain and husk is, indeed, the heaviest item in the bill of fare for all the months excepting June and July, which were the months of maximum insect consumpt.

Calendar of Rook-Foods.—We now sum up the whole facts and figures of rook diet in the form of a calendar, which shows when and how often each food-stuff was in use.

CALENDAR OF LOOK FOODS.

| 1894. | | | | | | | | | | | | 1895. | | Total |
|---------------------|--|--|--|--|---|--|--|---------------------------------------|---------------------------------------|-------------------------------|--|-------|--|-------|
| March. | April. | May. | June. | July. | August. | September. | October. | November. | December. | January. | February. | | | |
| Insects, grubs, &c. | 0 Insects 3 Grubs 2 Earth-worms | 7 Insects 6 Grubs 1 Earth-worms 2 Molluscs | 11 Insects 8 Grubs 0 Earth-worms | 16 Insects 2 Grubs 0 Earth-worms | 10 Insects 3 Grubs 1 Earth-worms | 10 Insects 0 Grubs 0 Earth-worms | 5 Insects 1 Grub 0 Earth-worms | 2 Insects 0 Grubs 0 Earth-worms | 1 Insects 0 Grubs 0 Earth-worms | 0 Insects 1 Grub 1 Eggs | 1 Insects 1 Grubs 1 Gasteropods | 1 | | |
| | 5 | 21 | 22 | 18 | 23 | 10 | 6 | 2 | 1 | 2 | 3 | 116 | | |
| Potatoes | 1 Potato | 11 Potato | 6 Potato | 0 Potato | 2 Potato | 0 Potato | 0 Potato | 0 Potato | 10 Potato | 6 Potato | 0 Potato | 86 | | |
| Straw and husk | Barley } 18 Wheat } Oat } | Barley } 28 Wheat } Oat } | Barley } 15 Oat } | 13 Oat | Barley } 26 Oat } | Barley } 25 Wheat } Oat } | Barley } 30 Wheat } Oat } Rye } | Barley 25 Oat | Barley } 20 Oat } | Barley } 34 Oat } | Barley } 38 Oat } | 200 | | |
| Manure | 5 Dung 4 Sea-shells 1 Earthy matter & mud | Artificial food 8 Ashy matter 1 Unrecog-nisable matter 1 | Artificial food 6 Grass-leaves 1 Sea-shells 1 Bone-meat 1 | Artificial food 2 Dung 1 Bone-meat 1 Unrecog-nisable matter 4 | Artificial food 3 Bone-meat 1 Hoony-substance 1 | Artificial food 1 Ashy matter 1 | Unrecog-nisable matter 1 | Ashy matter 1 Shell-sand 1 | Ashy matter 1 Earthy matter 1 | Sea-shells 1 | Dung 1 Flesh 1 Artificial food 2 Shell-sand 1 | 60 | | |
| | 11 | 5 | 9 | 8 | 5 | 2 | 1 | 2 | 2 | 1 | 5 | 602 | | |

27 ROOKS,

| No. | Date. | Hour. | Weather. | Place and Occasion. | Quantity. | Insects, &c. |
|-----|-------|-----------|--------------------|---------------------|--------------|--------------|
| 1 | 1st | 3 p.m. | Stormy | Montrave | Full | Earthworms |
| 2 | ... | ... | ... | .. | do. | do. |
| 3 | 3d | 4.30 p.m. | Fine | Lundin | Fairly full | . |
| 4 | .. | .. | ... | ... | Not full | |
| 5 | 8th | 10 a.m. | Fair | Lundin | Almost empty | .. |
| 6 | ... | ... | ... | ... | Not full | . |
| 7 | 9th | 9 a.m. | Fair | Lundin | Fairly full | 1 grub |
| 8 | 10th | 1 p.m. | Fair | Montrave | Full | .. |
| 9 | .. | .. | ... | ... | Not full | .. |
| 10 | 13th | 10 a.m. | Cold and bright | Lundin | Fairly full | . |
| 11 | 14th | 9.30 a.m. | Fair | Lundin | Fairly full | |
| 12 | 15th | 10 a.m. | Fine | Lundin | Packed | . |
| 13 | 15th | 4 p.m. | Fine | Lundin | Packed | |
| 14 | ... | ... | ... | ... | Fairly full | .. |
| 15 | 16th | 7 p.m. | Fine and bright | Durie | Full | |
| 16 | 17th | 6 p.m. | Fair | Lundin | Fairly full | |
| 17 | ... | ... | ... | .. | do. | . |
| 18 | ... | ... | .. | ... | Not full | .. |
| 19 | ... | ... | .. | .. | Almost empty | . |
| 20 | 19th | 6 p.m. | Lovely | Hatton | | A few grubs |
| 21 | ... | .. | ... | .. | Full | ... |
| 22 | 21st | 3 p.m. | Fair | Prati | Almost empty | . |
| 23 | ... | ... | ... | ... | Half full | . |
| 24 | ... | ... | ... | ... | Fairly full | .. |
| 25 | 24th | 5 p.m. | Very fine, E. wind | Lundin | Not full | 2 grubs |
| 26 | 24th | 5 p.m. | Very fine, E. wind | Letham | Fairly full | . |
| 27 | 26th | 3 p.m. | Very fine, E. wind | Lundin | Fairly full | .. |

Food.—A glance at the record for this month shows that grain and husk were most largely taken; dung and artificial foods are also well represented. Grubs occur thrice, earthworms twice, potato once. Rook 7 is specially interesting for its content of sprouted wheat, evidently the farmer's seed.

MARCH 1894.

| Roots. | Grain and Husk. | Miscellaneous. | Remarks. | No. |
|--------|-----------------------------|---|----------|-----|
| .. | Grain | . | .. | 1 |
| ... | Chiefly grain | .. | .. | 2 |
| .. | ... | Feeding-cake | .. | 3 |
| .. | .. | Horse-dung | .. | 4 |
| . | A few barley-grains | .. | .. | 5 |
| .. | A few grains of oat | Pieces of sea-shells | .. | 6 |
| ... | Wheat-grains, some sprouted | Earthy matter | .. | 7 |
| .. | Crushed grain | ... | .. | 8 |
| .. | Wheat | ... | ... | 9 |
| ... | Oat-grains | Dung | ... | 10 |
| ... | Wheat | Dung | ... | 11 |
| ... | ... | Crushed grains, artificial food mixture | ... | 12 |
| .. | ... | Crushed grains, artificial food mixture | ... | 13 |
| ... | Grain-husk | .. | .. | 14 |
| Potato | . | .. | ... | 15 |
| .. | . | Dung | ... | 16 |
| . | . | do. | ... | 17 |
| ... | ... | Earthy matter and small stones | .. | 18 |
| .. | . | ... | .. | 19 |
| .. | Wheat and oat-grains | .. | .. | 20 |
| . | Barley-grain | .. | .. | 21 |
| .. | A few grain-husks | ... | . | 22 |
| ... | Grain-husks | .. | .. | 23 |
| .. | Barley-grain | ... | ... | 24 |
| ... | Barley-grain | .. | ... | 25 |
| .. | Crushed grains | ... | ... | 26 |
| ... | Crushed grains | .. | .. | 27 |

Quantity.—Although a number of the gizzards were well filled with food, some contained but little, and three were almost empty.

25 ROOKS,

| No. | Date. | Hour. | Weather. | Place and Occasion. | Quantity. | Insects, &c. |
|-----|-------|-----------|----------------|----------------------------------|--------------|--------------------------------|
| 28 | 2d | 4 p.m. | Good | Lundin, on tree | Fairly full | ... |
| 29 | ... | ... | ... | ... | do. | .. |
| 30 | ... | ... | ... | ... | do. | ... |
| 31 | 3d | 9 a.m. | Good | Lundin, trapped | Fairly full | .. |
| 32 | 5th | 3 p.m. | Very fine | Nether Pratis, on ploughed field | Fairly full | .. |
| 33 | 5th | 5 p.m. | Very fine | Sunnybraes, on tree | Fairly full | ... |
| 34 | ... | ... | ... | ... | do. | ... |
| 35 | 5th | 6.30 p.m. | Very fine | Lundin, on tree | Fairly full | . |
| 36 | ... | ... | ... | ... | do. | ... |
| 37 | 9th | 3 p.m. | Mild and fine | Balcormo, on old grass | Fairly full | ... |
| 38 | 10th | 1 p.m. | Very fine | Balcormo, on old grass | Fairly full | ... |
| 39 | 10th | 4.15 p.m. | Very fine | Montrave, on grass | Full | 33 caterpillars and 1 wireworm |
| 40 | 10th | 6.30 p.m. | Very fine | Lundin, flying | Fairly full | ... |
| 41 | 11th | 3.30 p.m. | Very fine | Lundin, in Crow Wood | Not full | ... |
| 42 | 11th | 4 p.m. | Very fine | Lundin, in Crow Wood | Very full | Pieces of earthworm |
| 43 | ... | ... | ... | ... | Fairly full | A few earthworms |
| 44 | 16th | 11 a.m. | Very mild | Largo House, flying | Fairly full | ... |
| 45 | 16th | 1 p.m. | Very mild | Largo House, flying | Not full | ... |
| 46 | 19th | 6.30 p.m. | Cold, but good | Bankhead, in Crow Wood | Fairly full | ... |
| 47 | 19th | 7.30 p.m. | Cold, but good | Bankhead, in Crow Wood | Not full | ... |
| 48 | ... | ... | ... | ... | Almost empty | ... |
| 49 | 21st | 6 p.m. | Very fine | Balcormo, on grass | Empty | .. |
| 50 | 21st | 6.15 p.m. | Very fine | Balcormo, on grass | Fairly full | ... |
| 51 | 23d | 3 p.m. | Dull and cold | Largo House, flying | Fairly full | ... |
| 52 | 24th | 3 p.m. | Cold and rain | Lundin, on grass | Not full | ... |

Food.—Grain was again most frequently taken. In many cases the grain was perfect. What was indubitably dung was found in four birds. Earthworm was found in two cases; bird 39 contained 33 grubs of daddy longlegs (*Tipula*) and one wireworm.

Quantity.—The gizzards were fairly well filled: one was almost empty, and still another quite empty.

APRIL 1894.

| Roots. | Grain and Husk. | Miscellaneous. | Remarks. | No. |
|--------|----------------------------------|-------------------------------|---|-----|
| ... | Barley | Dung | ... | 28 |
| ... | do. | do. | ... | 29 |
| ... | Oats and barley | do. | .. | 30 |
| ... | Barley | Dung | ... | 31 |
| ... | Oats and barley; husks | ... | ... | 32 |
| .. | Barley | Earthy matter | ... | 33 |
| ... | do. | do. | ... | 34 |
| ... | Grain-husk | ... | ... | 35 |
| ... | Barley | ... | ... | 36 |
| ... | Crushed grain | ... | ... | 37 |
| ... | Crushed grain | ... | May have been taken from sheep's boxes | 38 |
| ... | Oats | ... | The caterpillars looked quite fresh, as if newly swallowed | 39 |
| ... | Crushed grain | ... | .. | 40 |
| . | Chiefly husk, 2 barley- corns | Small pieces of sea-shells | .. | 41 |
| .. | Oat and barley. Husk | .. | ... | 42 |
| ... | Oat. Husk | ... | .. | 43 |
| .. | Oat. Husk | .. | .. | 44 |
| .. | .. | Earthy matter | ... | 45 |
| .. | Oats | ... | ... | 46 |
| ... | Husk | ... | ... | 47 |
| . | . | Only a little mud | ... | 48 |
| . | .. | . | ... | 49 |
| .. | Barley. Husk | .. | ... | 50 |
| .. | Oat. Husk | ... | ... | 51 |
| .. | Husk | .. | ... | 52 |

Contents of Rook-crop.—Mr Lumsden of Arden sent in for examination a rook with its crop full of food. The crop contained—grubs of daddy longlegs, 17; earthworms, 2; oat-grains, a fair quantity (not counted).

The gizzard of this bird was also examined: it was found to contain partially digested matter and grain-husks.

37 ROOKS,

| No. | Date. | Hour. | Weather. | Place and Occasion. | Quantity. | Insects, &c. |
|-----|-------|-----------|---------------|-------------------------------|-------------|--|
| 53 | 1st | 3 p.m. | Fine | Pilmuir, flying | Fairly full | ... |
| 54 | 1st | 4.30 p.m. | Fine | Bankhead, flying | Empty | ... |
| 55 | .. | .. | .. | .. | Fairly full | 1 grub |
| 56 | 3d | 8 p.m. | Cold, blowing | Bankhead, flying | Fairly full | . |
| 57 | ... | .. | .. | . | Not full | Several grubs |
| 58 | .. | .. | .. | .. | Fairly full | 9 grubs |
| 59 | 7th | 7 a.m. | Good | Lundin, on sown barley | Fairly full | .. |
| 60 | 7th | 2 p.m. | Good | Pilmuir, in Crow Wood | Fairly full | Earthworms |
| 61 | 7th | 5 p.m. | Good | Pilmuir, at Four-banks | Fairly full | 6 earthworms |
| 62 | 10th | 7.30 p.m. | Wet | Bankhead, in Crow Wood | Fairly full | 10 earthworms |
| 63 | . | .. | . | .. | do. | 4 earthworms |
| 64 | ... | .. | .. | .. | Full | .. |
| 65 | 12th | 1.30 p.m. | Lovely | Lundin Mill, flying | Fairly full | ... |
| 66 | 12th | 5.30 p.m. | Lovely | Bankhead, flying | Full | A few earthworms |
| 67 | ... | .. | . | . | Empty | ... |
| 68 | . | .. | .. | . | Fairly full | ... |
| 69 | 14th | 7.30 p.m. | Very wet | Bankhead, flying in Crow Wood | Fairly full | ... |
| 70 | 15th | 1 p.m. | Wet | Lundin Mill, flying | Full | ... |
| 71 | 16th | 6.30 p.m. | Good | Pilmuir, Crow Wood | Full | Several molluscs |
| 72 | . | .. | . | . | do. | ... |
| 73 | . | ... | . | . | do. | ... |
| 74 | 16th | 7.30 p.m. | Good | Bankhead, in Crow Wood | Fairly full | 1 caterpillar, remnants of insects |
| 75 | .. | .. | ... | .. | Full | 2 caterpillars, remnants of beetles, 1 earthworm |
| 76 | . | .. | .. | .. | do. | ... |
| 77 | . | .. | . | . | Empty | .. |
| 78 | 21st | 7 p.m. | Frosty | Bankhead, flying | Full | Remnants of insects—beetles |
| 79 | .. | . | .. | .. | Fairly full | A few remnants of insects |
| 80 | . | .. | .. | .. | do. | 1 insect |

MAY 1894.

| Roots. | Grain and Husk. | Miscellaneous. | Remarks. | No. |
|-----------------|---------------------------|---|--|----------|
| ... | Oat-husk | ... | ... | 53 |
| | Oat-husk ... | ... | ... | 54 55 |
| ... | Barley, some sprouting | ... | ... | 56 |
| ... | Grain-husks | ... | ... | 57 58 |
| ... | Barley | ... | ... | 59 |
| ... | Sprouted barley and husks | .. | ... | 60 |
| ... | Barley and husks | ... | ... | 61 |
| ... | Oats and husks | ... | ... | 62 |
| Potato | Grain-husks do. | ... | ... | 63 64 |
| .. | Oats and husks | ... | . | 65 |
| Potato | ... | ... | . | 66 |
| ... | ... | ... | .. | 67 |
| .. | Oats and husks | ... | .. | 68 |
| Potato | ... | ... | ... | 69 |
| Potato | Grain and husk | ... | ... | 70 |
| A little potato | Grain and husk chiefly | ... | ... | 71 |
| Potato | Grain-husks | ... | ... | 72 |
| ... | Oats, some sprouted | Artificial food mixture containing Indian corn | Probably fowl's meat | 73 |
| .. | Grain and husk | ... | .. | 74 |
| Potato | Sprouted oats and husks | ... | .. | 75 |
| ... | Wheat | .. | ... | 76 |
| | ... | ... | ... | 77 |
| .. | Grain and husk | Pieces of egg-shell and artificial food mixture | Artificial food | 78 |
| .. | do. | Pieces of egg-shell and artificial food mixture | Artificial food. Tapeworm in abdominal cavity, not in alimentary canal | 79 |
| .. | Wheat and oats | Ashy matter | ... | 80 |

37 ROOKS.

| No. | Date. | Hour. | Weather. | Place and Occasion. | Quantity. | Insects, &c. |
|-----|-------|-----------|----------|------------------------|-------------|--------------------------------|
| 81 | 22d | 8 p.m. | Lovely | Bankhead, flying | Fairly full | A few insect remnants |
| 82 | 24th | 3 p.m. | Good | Lundin Mill, flying | Fairly full | ... |
| 83 | 24th | 7 p.m. | Good | Bankhead, in Crow Wood | Fairly full | .. |
| 84 | 28th | 6.30 p.m. | Wet | Bankhead, in Crow Wood | Fairly full | ... |
| 85 | ... | ... | .. | ... | do. | .. |
| 86 | 28th | 8 p.m. | Wet | Bankhead, in Crow Wood | ... | Various insects and earthworms |
| 87 | ... | ... | ... | ... | Empty | .. |
| 88 | 31st | 1 p.m. | Good | Montrave, flying | Not full | Grubs |
| 89 | 31st | 3 p.m. | Good | Balcormo, on grass | ... | Remnants of insects |

Food.—The record for this month shows that the diet is more varied than previously—insects, potato, and grain are at command. The grain column is again most largely filled, but insects and potatoes are also in considerable prominence. That seed-grain was freely attacked is shown by the sprouted grains which were found in rooks numbered 56, 60, 73, 75. The birds commenced to use potato about the 10th of the month.

MAY 1894.—CONTINUED.

| Roots. | Grain and Husk. | Miscellaneous. | Remarks. | No. |
|--------|--|---------------------------------|----------|-----|
| ... | Oats and barley | ... | .. | 81 |
| Potato | A little partially digested grain | ... | .. | 82 |
| ... | Partially digested grain | ... | .. | 83 |
| Potato | Partially digested grain the chief content | ... | . | 84 |
| do. | Partially digested grain | ... | . | 85 |
| ... | Partially digested grain | ... | .. | 86 |
| ... | ... | ... | .. | 87 |
| Potato | ... | ... | . | 88 |
| ... | ... | Unrecognisable vegetable matter | .. | 89 |

Grain and husk occurred in 28 birds, potato in 11, insects (adults) in 7, grubs in 6, earthworms in 7, molluscs in 1, artificial foods in 3.

Quantity.—The gizzards, as a rule, were fairly full, but in four birds they were perfectly empty.

| No. | Date. | Hour. | Weather. | Place and Occasion. | Quantity. | Insects, &c. |
|-----|-------|------------|----------------|----------------------------------|--------------|----------------------------|
| 90 | 1st | 3 p.m. | Good | Montrave | | Grubs and beetles |
| 91 | 2d | 4 p.m. | Warm | Lundin | Almost empty | .. |
| 92 | 4th | 8 a.m. | Good | Bankhead, in Crow Wood | | Grubs and insect remnants |
| 93 | . | .. | ... | | .. | . |
| 94 | 6th | 4 p.m. | Good | Bankhead, flying | | . |
| 95 | 6th | 4.30 p.m. | Good | Bankhead, flying | | Remnants of beetles |
| 96 | . | .. | ... | .. | .. | Some insect remnants |
| 97 | 11th | 4.30 p.m. | Dull, but fair | Bankhead, in Crow Wood | Not full | Skin of one caterpillar |
| 98 | .. | .. | .. | .. | Fairly full | ... |
| 99 | 11th | 5.30 p.m. | Dull, but fair | Bankhead, in Crow Wood | | .. |
| 100 | . | . | . | . | Packed | 1 grub |
| 101 | 14th | 5 p.m. | Good | Montrave, 2 flying and 1 trapped | Fairly full | Remnants of insects |
| 102 | . | .. | . | . | Full | do. |
| 103 | .. | .. | . | . | Fairly full | A few insect remnants |
| 104 | 18th | 4 p.m. | Good | Lundin Mill, on tree | Full | Various grubs and 1 beetle |
| 105 | .. | . | .. | . | Almost empty | Remains of 2 beetles |
| 106 | .. | .. | .. | . | Fairly full | ... |
| 107 | 18th | 4.40 p.m. | Good | Lundin Mill, on tree | Empty | |
| 108 | .. | .. | . | . | Fairly full | Grubs and beetles |
| 109 | 19th | 12.30 p.m. | Good | Balcormo, flying | Packed | .. |
| 110 | 19th | 3 p.m. | Good | Largo, flying | Not full | 1 grub |
| 111 | . | . | . | . | Packed | Various grubs |
| 112 | 21st | 12 noon | Good | Pilmuir, flying | Fairly full | Traces of insects |
| 113 | 21st | 4 p.m. | Good | Pilmuir, flying | Almost empty | |
| 114 | 21st | 5 p.m. | Good | Pilmuir, flying | Full | . |
| 115 | . | . | . | . | do. | . |
| 116 | 25th | 1 p.m. | Very fine | Pratis, flying | Full | Remnants of insects |
| 117 | 25th | 4 p.m. | Very fine | Aithernie Den | Fairly full | Remnants of insects |
| 118 | 27th | 8 p.m. | Good | Montrave, flying | Fairly full | Remnants of insects |

Food.—In the record for this month the food taken is spread out over all the columns. The insect column is filled best of all, next comes grain, next artificial foods, and last of all potato. The use of potato ceased after the 18th of this month. Insects occur 14 times, grubs 8, potatoes 6, grain and husks 15, artificial foods 6. Pieces of sea-shell occurred in one bird, and small stones with bone-meal in another.

JUNE 1894.

| Roots. | Grain and Husk. | Miscellaneous. | Remarks. | No. |
|------------------|------------------------------------|---|--|-----|
| .. | Oats and grain-husk | ... | . | 90 |
| Traces of potato | Traces of grain | . | . | 91 |
| ... | ... | .. | . | 92 |
| .. | .. | Artificial food mixture | Probably from pheasant's dish | 93 |
| Potato | . | .. | | 94 |
| .. | Oats and husk | .. | .. | 95 |
| .. | .. | Artificial food mixture | Probably from pheasant's dish | 96 |
| .. | .. | Small stones and bone-meal | . | 97 |
| Potato | Traces of grain | . | . | 98 |
| .. | . | Artificial food mixture | Probably from pheasant's dish: a very young bird | 99 |
| Potato | . | .. | . | 100 |
| .. | Grain-husks | .. | | 101 |
| .. | Grain-husks | .. | | 102 |
| .. | Grain-husks | .. | | 103 |
| . | Husk the bulk of contents | . | . | 104 |
| .. | ... | | | 105 |
| Potato | . | Several partially digested pieces of grass-leaves | | 106 |
| Potato | . | Artificial food mixture | Probably from sheep-box | 107 |
| ... | Mixed grain, chiefly oats | ... | .. | 108 |
| .. | Grain-husks | Pieces of sea-shells | . | 109 |
| ... | ... | Artificial food mixture | | 110 |
| ... | Grain-husks | .. | . | 111 |
| . | Traces of grain-husks | . | | 112 |
| . | Partially digested grain do. | ... | . | 113 |
| .. | .. | .. | . | 114 |
| . | .. | Artificial food mixture with egg-shells | . | 115 |
| .. | Partially digested and mixed grain | ... | Likely from feeding-dish | 116 |
| ... | Partially digested grain | ... | .. | 117 |
| | | | | 118 |

Young Birds.—The young birds show decided preference for the artificial foods and the grubs.

Quantity.—The gizzards are well filled and sometimes packed. One bird was empty and two almost empty.

24 ROOKS,

| No. | Date. | Hour. | Weather. | Place and Occasion. | Quantity. | Insects, &c. |
|-----|-------|-----------|------------------|--------------------------------|--------------|--------------------------------|
| 119 | 2d | 4 p.m. | Warm and thunder | Lundin, flying | Fairly full | A few beetle remnants |
| 120 | 3d | 7 a.m. | Good | Lundin, flying | Fairly full | Beetle remnants |
| 121 | 3d | 4 p.m. | Good | Pratis, on plough | Fairly full | 1 grub and beetle remnants |
| 122 | . | ... | ... | ... | Full | ... |
| 123 | .. | .. | ... | ... | Not full | Remnants of insects |
| 124 | . | .. | .. | Montrave, flying | Full | Principally insects |
| 125 | 4th | 12 noon | Good | Montrave, flying | Fairly full | ... |
| 126 | 9th | 1 p.m. | Good | Balcormo, on old grass | Fairly full | ... |
| 127 | 9th | 2 p.m. | Good | Balcormo, on old grass | Not full | A few beetle remnants |
| 128 | .. | . | .. | .. | do. | A few beetle remnants |
| 129 | . | .. | ... | .. | Full | 12 grubs and pieces of beetles |
| 130 | . | ... | ... | . | do. | A few beetle remnants |
| 131 | 12th | 2 p.m. | Wet | Lundin, flying | Full | Beetle remnants |
| 132 | 12th | 2.30 p.m. | Wet | Lundin, flying | Full | Principally beetles |
| 133 | 17th | 3 p.m. | Showery | Blacketyside, on cut hay-field | Empty | .. |
| 134 | 17th | 4 p.m. | Showery | Balcormo, on old grass | Almost empty | 1 or 2 pieces of insects |
| 135 | 17th | 3 p.m. | Showery | Blacketyside, Crow Wood | Empty | ... |
| 136 | 18th | 2 p.m. | Wet | Montrave, flying | Not full | Insects and remnants |
| 137 | ... | ... | .. | ... | do. | Insects |
| 138 | | | .. | .. | Packed | .. |
| 139 | 18th | 3.30 p.m. | Wet | Montrave, flying | Fairly full | A few insect remnants |
| 140 | ... | ... | ... | ... | do. | Insect remnants |
| 141 | 30th | 1 p.m. | Good | Greenside flying | Empty | ... |
| 142 | .. | ... | ... | ... | Not full | ... |

Food.—The column for roots (potato) is now perfectly empty, that for grain is well filled, but the *insect foods* are again most prominent of all.

Insects occur 16 times, grubs 2 (12 grubs in No. 129), grain and husks 13, pheasant's food mixture and cakes 6.

Bone-meal had been taken by rook 119. Much of the oat-grain looked and smelt as if got from dung. As before, the young birds favoured the artificial foods.

JULY 1894.

| Roots. | Grain and Husk. | Miscellaneous. | Remarks. | No. |
|--------|-----------------------------------|--|----------|------------|
| ... | Partially digested grain | Some bone-meal | .. | 119 |
| . | Partially digested grain | .. | ... | 120 |
| . | Partially digested grain | .. | . | 121 |
| . | Oat-grains | . | . | 122 |
| ... | ... | ... | .. | 123 |
| ... | A little digested grain | ... | .. | 124 |
| . | Oats | .. | .. | 125 |
| ... | ... | Artificial food mixture containing Indian corn | .. | 126 |
| .. | Partially digested grain | Unrecognisable vegetable matter—probably cake | . | 127 |
| .. | ... | do. | . | 128 |
| .. | Partially digested grain | do. | . | 129 |
| ... | Mixed grains | ... | . | 130 |
| | .. | .. | | 131 |
| .. | A little partially digested grain | ... | .. | 132 |
| . | .. | ... | | 133 |
| ... | .. | .. | .. | 134 |
| | . | ... | .. | 135 |
| .. | A little grain and husk | .. | | 136 137 |
| .. | Oats | Horse dung | | 138 |
| . | .. | Artificial food mixture containing Indian corn | . | 139 |
| . | . | Unrecognisable vegetable matter | . | 140 |
| ... | Partially digested grain | ... | .. | 141 |
| ... | | | .. | 142 |

Food in Kirkcudbrightshire.—Towards the end of the month Mr Gordon of Keltonhill shot on the potato-field a pair of rooks for special examination. The gizzards of both were found packed with potato.

Quantity.—For the most part the gizzards were full, except in three birds, which were perfectly empty.

30 ROOKS,

| No. | Date. | Hour. | Weather. | Place and Occasion. | Quantity. | Insects, &c. |
|-----|-------|------------|----------------|--------------------------|-----------------|---------------------------------|
| 143 | 1st | 3.30 p.m. | Showery | Nether Pratis, on grass | Fairly full | Insects and remnants |
| 144 | 2d | 1 p.m. | Showery | Durie, on grass | Not full | Insects and earthworms |
| 145 | 2d | 3 p.m. | Showery | Bankhead, on old grass | Fairly full | Grubs and insects |
| 146 | 6th | 9 a.m. | Cold, but good | Balcormo, on grass | Full | 1 or 2 insects |
| 147 | 6th | 12.30 p.m. | Cold, but good | Montrave, on old grass | Fairly full | .. |
| 148 | .. | ... | ... | .. | do. | .. |
| 149 | 6th | 2.30 p.m. | Cold, but good | Montrave, flying | Almost empty | A few insect remnants |
| 150 | 9th | 2.30 p.m. | Wet | Montrave, on grass | Full | Many beetles |
| 151 | 13th | 11 a.m. | Good | Montrave, flying | ... | ... |
| 152 | .. | .. | ... | ... | Not full | Insect remnants |
| 153 | 13th | 2.30 p.m. | Good | Durie, on cut hay | ... | ... |
| 154 | 15th | 7 p.m. | Wet | Blacketyside, on cut hay | Not at all full | .. |
| 155 | .. | ... | ... | ... | Fairly full | ... |
| 156 | .. | ... | .. | ... | Almost empty | ... |
| 157 | ... | .. | .. | .. | Full | .. |
| 158 | .. | .. | ... | .. | do. | .. |
| 159 | 16th | 1.30 p.m. | Good | Montrave, flying | Fairly full | A few insect remnants |
| 160 | 16th | 2.15 p.m. | Good | Montrave, flying | Not full | .. |
| 161 | 17th | 9 a.m. | Wet | Balcormo, on old grass | Full | Insect remnants |
| 162 | ... | .. | .. | ... | do. | do. |
| 163 | 20th | 12.30 p.m. | Good | Montrave, on grass | Fairly full | Traces of insects |
| 164 | 20th | 3 p.m. | Good | Montrave, on grass | Full | Remnants of weevils |
| 165 | 23d | 1 p.m. | Good | Aithernie Den, flying | Fairly full | Chiefly insects and a few grubs |

AUGUST 1894.

| Roots. | Grain and Husk. | Miscellaneous. | Remarks. | No. |
|--------|------------------------------------|---|-------------------------|-----|
| ... | Grain and husk | ... | ... | 143 |
| .. | . | ... | ... | 144 |
| Potato | Partially digested oats | Some bone-meal | .. | 145 |
| ... | Barley | ... | . | 146 |
| ... | ... | Crushed Indian corn and artificial food mixture | ... | 147 |
| ... | ... | Artificial food mixture, probably for pheasants | ... | 148 |
| ... | ... | ... | ... | 149 |
| ... | Barley | Horny matter | .. | 150 |
| ... | Partially digested barley | Artificial food mixture | ... | 151 |
| ... | Digested grain | ... | .. | 152 |
| .. | Partially digested barley | .. | . | 153 |
| .. | Grain and husks | | | 154 |
| . | Partially digested grain | .. | | 155 |
| . | Remains of grain | ... | .. | 156 |
| Potato | Partially digested grain | ... | ... | 157 |
| ... | Partially digested barley | ... | .. | 158 |
| .. | Partially digested grain | . | Tapeworm in body cavity | 159 |
| ... | Partially digested barley | .. | ... | 160 |
| ... | Partially digested oats | ... | ... | 161 |
| ... | Partially digested grain | ... | ... | 162 |
| ... | Digested grain | ... | ... | 163 |
| ... | Partially digested oats and barley | ... | ... | 164 |
| ... | Partially digested grain | ... | ... | 165 |

30 ROOKS,

| No. | Date. | Hour. | Weather. | Place and Occasion. | Quantity. | Insects, &c. |
|-----|-------|-----------|----------|---------------------|-------------|---------------------------------|
| 166 | 23d | 2 p.m. | Good | Montrave, flying | Fairly full | A few beetle remnants |
| 167 | 23d | 2.30 p.m. | Good | Montrave, flying | Full | Some insect remnants |
| 168 | . | ... | . | .. | do. | Insect remnants |
| 169 | 27th | 9 a.m. | Good | Balcormo, on grass | Full | Grubs and beetles |
| 170 | 27th | 10 a.m. | Good | Montrave, flying | Full | ... |
| 171 | 28th | 9 a.m. | Good | Balcormo, on grass | Not full | A few beetle remnants |
| 172 | 25th | 10 a.m. | Good | Balcormo, on grass | Full | Large number of beetle remnants |

Food.—*Grain*, chiefly barley, is now in strongest evidence, and next to it comes insects. The insect is misleading as to quantity—grain is the staple food, and the insect is merely a dainty tit-bit going with it. Only in two birds (Nos. 144 and 149) were the insects unaccompanied by the grain. Furthermore, judging by the appearance of the whole grain, and by the colour of that partially digested, one can only conclude that the bulk of it has been derived from crop and not from dung. Potatoes—quite sporadic—are met with only in two birds, and then they are subordinate in quantity to the accompanying grain.

AUGUST 1894.—CONTINUED.

| Roots. | Grain and Husk. | Miscellaneous. | Remarks. | No. |
|--------|-----------------------|----------------|---|-----|
| ... | Digested oats chiefly | ... | ... | 166 |
| ... | Oats | ... | ... | 167 |
| ... | Digested oats | ... | .. | 168 |
| ... | Digested grain | ... | ... | 169 |
| ... | Barley | ... | .. | 170 |
| ... | Oats | .. | ... | 171 |
| ... | Barley | ... | Tapeworm in abdominal body cavity ; a number of stones in gizzard | 172 |

Insects occur 19 times, grubs 3, earthworm 1, grains (chiefly barley) 26, potatoes 2, artificial foods 3.

Mixed Diet.—Rook 145 affords an exquisite example of mixed diet. Its gizzard contained grubs, insects, potato, oats, and bone-meal.

Quantity.—The gizzards were well filled, and none were totally empty.

31 ROOKS.

| No. | Date. | Hour. | Weather. | Place and Occasion. | Quantity. | Insects, &c. |
|-----|-------|------------|------------|------------------------|--------------|----------------------|
| 173 | 3d | 4.30 p.m. | Good | Blacketyside, on grass | Packed | ... |
| 174 | 6th | 9 a.m. | Good | Pilmuir, on turnips | Full | Beetles |
| 175 | 10th | 10 a.m. | Good | Montrave, on grass | Fairly full | Beetles |
| 176 | 10th | 11.30 a.m. | Good | Balcormo, on grass | Fairly full | Beetles |
| 177 | 12th | 12 noon | Very fine | Greenside, on grass | Fairly full | Remnants of insects |
| 178 | 13th | 9 a.m. | Very fine | Upper Pratis, on grass | Fairly full | ... |
| 179 | 14th | 6 a.m. | Very fine | Pilmuir, flying | Empty | . |
| 180 | 17th | 8.30 a.m. | Fine, dull | Balcormo, on grass | Full | Remnants of insects |
| 181 | 17th | 9 a.m. | Fine, dull | Montrave, flying | Almost empty | ... |
| 182 | .. | ... | ... | ... | Fairly full | . |
| 183 | ... | ... | Fine, dull | Lundin, on tree | Packed | ... |
| 184 | 17th | 10 a.m. | Fine, dull | Upper Pratis, on grass | Packed | .. |
| 185 | 17th | 10.30 a.m. | Fine, dull | Montrave, flying | Full | .. |
| 186 | 18th | 11 a.m. | Lovely | Montrave, flying | Packed | . |
| 187 | 18th | 6 p.m. | Lovely | Hatton, on wheat-field | Full | Insect remnants |
| 188 | 19th | 7 a.m. | Good | Pilmuir, flying | Full | . |
| 189 | 19th | 7 p.m. | Good | Ramornie | Fairly full | .. |
| 190 | ... | ... | ... | ... | do. | .. |
| 191 | ... | ... | ... | ... | do. | ... |
| 192 | ... | ... | ... | ... | Empty | ... |
| 193 | 21st | 7 a.m. | Good | Lundin, on tree | Empty | .. |
| 194 | 24th | 7 a.m. | Good | Balcormo, on grass | Full | Insects and remnants |
| 195 | 24th | 4 p.m. | Good | Balcormo, on grass | Fairly full | ... |
| 196 | 25th | 8.30 a.m. | Good | Balcormo, on grass | Full | Insects and remnants |
| 197 | ... | ... | ... | ... | do. | Insects |
| 198 | 26th | 5.30 p.m. | Good | Ramornie | Fairly full | ... |
| 199 | ... | ... | ... | ... | do. | .. |
| 200 | .. | ... | ... | ... | do. | ... |
| 201 | .. | ... | ... | ... | do. | ... |
| 202 | .. | ... | ... | ... | do. | Insects |
| 203 | ... | ... | ... | ... | do. | ... |

Food.—Again the column by far and away the best filled up is that for grain and husk; in addition, insects are met with ten times, and artificial food once. As before, the insects are associated with grain and husk, except in rooks 180 and 194. A good deal of the insects taken this month appear to have been got from grass.

SEPTEMBER 1894.

| Roots. | Grain and Husk. | Miscellaneous. | Remarks. | No. |
|--------|--------------------------|-------------------------|-----------------------------------|-----|
| ... | Oats | ... | ... | 173 |
| ... | Grain-husk | ... | .. | 174 |
| ... | Oats | .. | Tapeworm in abdominal body cavity | 175 |
| ... | Partially digested grain | . | .. | 176 |
| ... | Oat-grains and husks | . | ... | 177 |
| ... | Oat-husk | Ashy matter | ... | 178 |
| ... | ... | ... | .. | 179 |
| ... | A few barley-grains | ... | ... | 180 |
| ... | A few grain-husks | .. | ... | 181 |
| ... | Barley | Artificial food mixture | . | 182 |
| .. | do. | | ... | 183 |
| .. | Crushed barley | . | | 184 |
| ... | Barley | .. | ... | 185 |
| ... | Grain-husk | .. | . | 186 |
| ... | Some grain-husk | .. | .. | 187 |
| ... | Barley | ... | ... | 188 |
| ... | Grain-husks | ... | ... | 189 |
| ... | do. | ... | ... | 190 |
| ... | do. | ... | ... | 191 |
| .. | ... | ... | ... | 192 |
| . | ... | .. | .. | 193 |
| .. | ... | .. | ... | 194 |
| .. | Grain-husk | ... | ... | 195 |
| .. | A little wheat | ... | ... | 196 |
| ... | | ... | . | 197 |
| ... | Wheat | ... | .. | 198 |
| .. | Partially digested grain | ... | ... | 199 |
| ... | do. | ... | ... | 200 |
| ... | Barley | ... | ... | 201 |
| ... | Partially digested grain | ... | ... | 202 |
| .. | Barley | ... | ... | 203 |

Quantity.—The gizzards were fairly well filled—sometimes packed; three were, however, perfectly empty.

30 ROOKS,

| No. | Date. | Hour. | Weather. | Places and Occasions. | Quantity. | Insects, &c. |
|-----|-------|------------|------------|--------------------------------------|-------------|-----------------------|
| 204 | 1st | 12.30 p.m. | Extra fine | Nether Pratis, flying | Full | ... |
| 205 | 5th | 10 a.m. | Good | Balcormo, on grass | Not full | Insects |
| 206 | 5th | 12 noon | Good | Upper Pratis, on grass | Full | ... |
| 207 | 5th | 5 p.m. | Good | Upper Pratis, on grass | Full | Some insect remnants |
| 208 | ... | ... | ... | ... | do. | ... |
| 209 | 6th | 9 a.m. | Wet | Montrave, one on barley, one on corn | Full | A few insect remnants |
| 210 | . | .. | .. | .. | Not full | ... |
| 211 | 8th | 11 a.m. | Good | Montrave, flying | Full | A few grubs |
| 212 | .. | ... | .. | ... | do. | .. |
| 213 | 8th | 5.30 p.m. | Good | Montrave, flying | Fairly full | .. |
| 214 | 9th | 9 a.m. | Good | Upper Pratis, on oats | Fairly full | ... |
| 215 | 9th | 10 a.m. | Good | Balcormo, on grass | Fairly full | ... |
| 216 | 9th | 10.30 a.m. | Good | Balcormo, on grass | Fairly full | A few insect remnants |
| 217 | 16th | 10 a.m. | Good | Balcormo, flying | Half full | Insect remnants |
| 218 | 16th | 11.30 a.m. | Good | Sunnybraes, flying | Not full | ... |
| 219 | 16th | 3 p.m. | Good | Montrave, flying | Full | ... |
| 220 | 16th | 5.30 p.m. | Good | Ramornie, on tree | Full | ... |
| 221 | ... | ... | ... | ... | Not full | ... |
| 222 | ... | ... | ... | ... | Full | ... |
| 223 | ... | ... | ... | ... | do. | ... |
| 224 | ... | ... | ... | ... | do. | ... |
| 225 | ... | ... | ... | ... | do. | ... |
| 226 | 18th | 11 a.m. | Very fine | Sunnybraes, flying | Fairly full | .. |
| 227 | 20th | 10.30 a.m. | Wet | Montrave, flying | Full | ... |
| 228 | 22d | 9 a.m. | Very fine | Montrave, flying | Full | .. |
| 229 | 22d | 9 a.m. | Very fine | Lundin, on tree | Full | ... |
| 230 | 22d | 10 a.m. | Very fine | Montrave, flying | Full | ... |
| 231 | 23d | 5 p.m. | Very fine | Ramornie, on tree | Full | ... |
| 232 | ... | ... | ... | ... | Fairly full | ... |
| 233 | 24th | 12.30 p.m. | Wet | Balcormo, on grass | Full | ... |

Food.—This is a very decided *grain* month, and barley is specially favoured. The only other foods used are, insects five times, grubs one, and cake one. Filthy and foul-smelling husks prevail in early year, but now cleanness and pleasant smell are characteristic both of grain and

OCTOBER 1894.

| Roots. | Grain and Husk. | Miscellaneous. | Remarks. | No. |
|--------|-------------------------------|------------------------------------|--------------------------------|-----|
| ... | Wheat | ... | ... | 204 |
| ... | Some partially digested grain | ... | ... | 205 |
| ... | Oat | ... | ... | 206 |
| ... | Chiefly barley | ... | ... | 207 |
| .. | Partially digested grain | Vegetable matter —probably cake | ... | 208 |
| ... | Barley, and entire grains | ... | ... | 209 |
| ... | Rye and husk | ... | .. | 210 |
| ... | Wheat and barley | . | .. | 211 |
| ... | Grain-husks | .. | . | 212 |
| .. | Grain-husks | . | .. | 213 |
| ... | Grain-husks | .. | ... | 214 |
| ... | Wheat and grain-husks | ... | ... | 215 |
| ... | Wheat | ... | .. | 216 |
| .. | ... | ... | .. | 217 |
| .. | Barley and husks | ... | .. | 218 |
| ... | Barley | ... | .. | 219 |
| ... | Grain-husks | ... | ... | 220 |
| ... | do. | ... | ... | 221 |
| ... | Barley, entire grains | .. | Gizzard contained stone grains | 222 |
| .. | do. | .. | ... | 223 |
| .. | do. | . | ... | 224 |
| .. | do. | ... | ... | 225 |
| ... | Grain-husks | ... | ... | 226 |
| ... | Barley | ... | ... | 227 |
| ... | Barley | ... | ... | 228 |
| ... | Barley | ... | ... | 229 |
| ... | Barley | ... | ... | 230 |
| ... | Barley | ... | ... | 231 |
| ... | Grain-husk | ... | ... | 232 |
| ... | Barley | ... | ... | 233 |

husk, and indicate a source other than dung. All the insects occur in comparatively small quantity, and associated with a good deal of grain and husk.

Quantity.—The gizzards are almost invariably well filled; not a single one was empty.

| No. | Date. | Hour. | Weather. | Place and Occasion. | Quantity. | Insects, &c. |
|-----|-------|------------|---------------|-------------------------------------|-------------|-------------------|
| 234 | 1st | 1.30 p.m. | Wet | Lundin, on tree | Fairly full | ... |
| 235 | 1st | 4 p.m. | Wet | Ramornie, on tree | Full | .. |
| 236 | 1st | 4.30 p.m. | Wet | Ramornie, on tree | Fairly full | .. |
| 237 | 1st | 5 p.m. | Wet | Ramornie, on tree | Full | .. |
| 238 | ... | ... | ... | ... | Fairly full | .. |
| 239 | 2d | 3 p.m. | Good | Durie, flying | Fairly full | Traces of insects |
| 240 | 5th | 11.30 a.m. | Good | Upper Pratis, flying | Fairly full | ... |
| 241 | 5th | 5 p.m. | Good | Ramornie, on tree | Full | ... |
| 242 | ... | ... | ... | ... | do. | ... |
| 243 | 6th | 5.20 p.m. | Cold and dull | Ramornie, on tree | Full | ... |
| 244 | 8th | 4.45 p.m. | Good | Ramornie, on tree | Full | .. |
| 245 | 8th | 5 p.m. | Good | Ramornie, on tree | Full | ... |
| 246 | 8th | 5.10 p.m. | Good | Ramornie, on tree | Fairly full | .. |
| 247 | 15th | 11.20 a.m. | Frosty | Montrave, flying | Full | ... |
| 248 | 15th | 12.30 a.m. | Good | Montrave, flying | Fairly full | .. |
| 249 | 15th | 3 p.m. | Good | Balcormo, on grass | Full | ... |
| 250 | 16th | 8 a.m. | Frosty | Ramornie, on tree | Empty | ... |
| 251 | ... | ... | ... | ... | do. | ... |
| 252 | ... | ... | ... | ... | do. | ... |
| 253 | 16th | 2.30 p.m. | Frosty | Nether Pratis, flying | Fairly full | ... |
| 254 | 16th | 3 p.m. | Frosty | Little Pilmuir, on newly sown wheat | Full | ... |
| 255 | 16th | 3.15 p.m. | Frosty | Little Pilmuir, on grass-field | Fairly full | Insects |
| 256 | 20th | 4 p.m. | Frosty | Ramornie, on tree | Packed | .. |
| 257 | 21st | 4 p.m. | Dull and raw | Ramornie, on tree | Full | ... |
| 258 | 21st | 4.15 p.m. | Dull & raw | Ramornie, on tree | Fairly full | .. |
| 259 | 21st | 5 p.m. | Dull & raw | Ramornie, on tree | Full | ... |
| 260 | 23d | 12 noon | Frosty | Lundin Wood, on tree | Full | ... |
| 261 | 28th | 3 p.m. | Good | Hatton, on grass | Fairly full | ... |

Food.—All the food columns are now blank, excepting that for *grain*; traces of insects, however, occur in two birds containing the grain.

Ishy Matter.—As the cereal grass in pigeons is found mixed with quartz granules, so the

NOVEMBER 1894.

| Roots. | Grain and Husk. | Miscellaneous. | Remarks. | No. |
|--------|------------------|------------------------------|--------------------------------|-----|
| ... | Grain-husks | Ashy material and shell-sand | ... | 234 |
| ... | Barley | ... | .. | 235 |
| ... | Grain-husks | ... | .. | 236 |
| ... | Barley | ... | ... | 237 |
| ... | Grain-husks | ... | ... | 238 |
| ... | Grain-husks | ... | . | 239 |
| .. | Grain-husks | ... | ... | 240 |
| ... | Barley and husks | ... | ... | 241 |
| ... | do. | ... | Gizzard contained ashy matter | 242 |
| ... | Barley and husks | ... | Gizzard contained quartz grain | 243 |
| ... | Barley and husks | .. | .. | 244 |
| ... | Barley and husks | ... | . | 245 |
| | Barley and husks | . | .. | 246 |
| . | Barley | . | .. | 247 |
| . | Grain-husks | .. | ... | 248 |
| .. | Grain-husks | .. | Gizzard contained ashy matter | 249 |
| . | ... | ... | ... | 250 |
| .. | ... | ... | ... | 251 |
| . | ... | ... | ... | 252 |
| ... | Grain-husks | ... | Gizzard contained ashy matter | 253 |
| .. | Barley | ... | ... | 254 |
| ... | A little barley | ... | ... | 255 |
| ... | Barley and husks | ... | ... | 256 |
| .. | Grain-husks | ... | ... | 257 |
| . | Grain-husks | ... | ... | 258 |
| .. | Grain-husks | ... | ... | 259 |
| ... | Barley | ... | ... | 260 |
| ... | Grain-husks | ... | ... | 261 |

grain-husks in rooks is often mixed with ashy matter and stones. This is specially remarked in birds 241, 243, 249, and 253.

Quantity.—Three of the gizzards were found empty, the others were well filled.

22 ROOKS,

| No. | Date. | Hour. | Weather. | Place and Occasion. | Quantity. | Insects, &c. |
|-----|-------|------------|----------------|------------------------|--------------|-------------------|
| 262 | 1st | 4.45 p.m. | Lovely | Ramornie, on tree | Packed | ... |
| 263 | ... | ... | ... | ... | do. | ... |
| 264 | ... | ... | ... | ... | do. | .. |
| 265 | 8th | 4 p.m. | Lovely | Ramornie, on tree | Fairly full | ... |
| 266 | ... | ... | ... | ... | do. | ... |
| 267 | .. | ... | ... | ... | Packed | ... |
| 268 | 11th | 4 p.m. | Wet | Ramornie, on tree | Full | ... |
| 269 | 12th | 12 noon | Good | Upper Pratis, on grass | Fairly full | ... |
| 270 | 13th | 4.30 p.m. | Showery | Ramornie, on tree | Fairly full | ... |
| 271 | ... | ... | ... | ... | do. | ... |
| 272 | 19th | 5 p.m. | Fair | Ramornie, on tree | Almost empty | ... |
| 273 | ... | ... | ... | ... | Packed | ... |
| 274 | .. | ... | ... | ... | Full | .. |
| 275 | 20th | 11.20 a.m. | Frost and fair | Ramornie, on tree | Fairly full | Traces of insects |
| 276 | 20th | 4.45 p.m. | Frost and fair | Ramornie, on tree | Fairly full | ... |
| 277 | 21st | 5 p.m. | Good | Ramornie, on tree | Fairly full | ... |
| 278 | 25th | 5 p.m. | Dull, but good | Ramornie, on tree | Full | ... |
| 279 | ... | ... | ... | ... | do. | ... |
| 280 | ... | ... | ... | ... | do. | ... |
| 281 | ... | ... | ... | ... | do. | ... |
| 282 | 28th | 5 p.m. | Good | Ramornie, on tree | Not full | ... |
| 283 | ... | ... | ... | ... | Empty | ... |

Food.—The foods now used are grain and potato. The outbreak on potato commenced about the 11th of the month. The potato met with in ten birds is associated with grain, except in one case, where a mixture of potato and earth was found. In one bird traces of insects were noticed.

Digestion of Food after Death.—In order to ascertain whether any extensive digestive action takes place after death, the rooks 275, 276, 277, shot on the 20th and 21st, were left unopened

DECEMBER 1894.

| Roots. | Grain and Husk. | Miscellaneous. | Remarks. | No. |
|-----------------|--------------------------|----------------|---|-----|
| ... | Partially digested grain | ... | ... | 262 |
| ... | Grain and husks | ... | Stones in gizzard | 263 |
| ... | do. | ... | ... | 264 |
| ... | Grain-husks | ... | Stones in gizzard | 265 |
| ... | do. | ... | ... | 266 |
| A little potato | do. | ... | Stones in gizzard | 267 |
| ... | Grain-husks | ... | ... | 268 |
| ... | Grain-husks | ... | ... | 269 |
| Some potato | Oats and husks | Earth | ... | 270 |
| Potato | ... | ... | ... | 271 |
| ... | Grain-husks | ... | Gizzard contained many stones | 272 |
| Potato | Grain and husks | ... | ... | 273 |
| do. | Grain-husk | Ashy matter | ... | 274 |
| ... | Barley and husk | ... | Contents of gizzard not examined till 8th Jan. 1895 | 275 |
| Potato | Barley and husk | .. | Contents of gizzard not examined till 8th Jan. 1895 | 276 |
| Potato | Barley | ... | Contents of gizzard not examined till 8th Jan. 1895 | 277 |
| ... | Grain-husks | ... | Stones in gizzard | 278 |
| Potato | A little husk | ... | ... | 279 |
| do. | do. | ... | Ramornie Woods are the central roosting-places of the rook in East Fife | 280 |
| do. | do. | ... | ... | 281 |
| ... | Whole barley and husks | ... | ... | 282 |
| ... | ... | ... | ... | 283 |

till 8th January. Abundance of undigested grain was then found in the gizzards.

Stony Matter.—In several instances noted in the record stony matter was found in the gizzards with grain and husks, comparable perhaps to the stones in pigeons' gizzards.

Quantity.—The birds show no sign of hard-upness; most of the gizzards were full, a few packed, and one completely empty.

35 ROOKS,

| No. | Date. | Hour. | Weather. | Place and Occasion. | Quantity. | Insects, &c. |
|-----|-------|------------|------------|--------------------------|--------------|--------------|
| 284 | 1st | 11 a.m. | Keen frost | Montrave, flying | Full | .. |
| 285 | 1st | 4.30 p.m. | Keen frost | Ramornie, on tree | ... | ... |
| 286 | ... | ... | ... | ... | Full | .. |
| 287 | ... | ... | ... | ... | do. | ... |
| 288 | 2d | 10.15 a.m. | Keen frost | Montrave, flying | Not full | ... |
| 289 | 2d | 10.30 a.m. | Keen frost | Montrave, on young grass | Almost empty | ... |
| 290 | 2d | 4.45 p.m. | Keen frost | Ramornie, flying | ... | ... |
| 291 | 3d | 11 a.m. | Keen frost | Montrave, flying | Not full | ... |
| 292 | 3d | 5 p.m. | Keen frost | Ramornie, on tree | ... | ... |
| 293 | ... | ... | ... | ... | ... | ... |
| 294 | 9th | 11.45 a.m. | Hard frost | Montrave, flying | Almost empty | .. |
| 295 | 9th | 5 p.m. | Hard frost | Ramornie, on tree | Full | .. |
| 296 | ... | ... | ... | ... | do. | .. |
| 297 | ... | ... | .. | .. | do. | ... |
| 298 | 10th | 12 noon | Hard frost | Montrave, on young grass | Almost empty | ... |
| 299 | 10th | 5 p.m. | Hard frost | Ramornie, on tree | Full | ... |
| 300 | ... | ... | ... | ... | do. | ... |
| 301 | ... | ... | ... | ... | do. | ... |
| 302 | 16th | 1 p.m. | Very wet | Montrave, flying | Fairly full | 1 grub |
| 303 | 16th | 2.30 p.m. | Very wet | Montrave, flying | Fairly full | ... |
| 304 | 17th | 5 p.m. | Very wet | Ramornie, on tree | Packed | ... |
| 305 | ... | .. | ... | .. | do. | ... |
| 306 | ... | ... | ... | .. | do. | ... |
| 307 | ... | ... | .. | ... | do. | ... |
| 308 | ... | ... | .. | ... | do. | ... |
| 309 | ... | ... | ... | ... | do. | Eggs, .. |
| 310 | 22d | 5 p.m. | Hard frost | Ramornie, on tree | Packed | ... |
| 311 | ... | ... | ... | ... | do. | .. |
| 312 | ... | ... | ... | ... | do. | ... |
| 313 | 23d | 3 p.m. | Hard frost | Ramornie, on tree | Full | .. |
| 314 | 24th | 5 p.m. | Hard frost | Ramornie, on tree | Empty | ... |
| 315 | ... | ... | ... | ... | Full | .. |
| 316 | 29th | 4.30 p.m. | Hard frost | Ramornie, flying | Full | ... |
| 317 | 30th | 5.30 p.m. | Hard frost | Ramornie, on tree | Full | ... |
| 318 | ... | ... | ... | ... | do. | ... |

Food.—Grain is again the staple food; potato appears sporadically in five birds, but always associated with grain—only in one bird (No. 304) was potato in excess of grain and husk. As for insects, one grub and a few eggs were alone noticed.

Quantity.—The birds again show no sign of food scarcity; packed and full gizzards were the

JANUARY 1895.

| Roots. | Grain and Husks. | Miscellaneous. | Remarks. | No. |
|-----------------------|------------------------|----------------------|----------------------------------|-----|
| ... | Oats | ... | ... | 284 |
| ... | Whole barley and husks | ... | Gizzard contained stone granules | 285 |
| Potato | Barley | .. | .. | 286 |
| .. | Barley and husks | .. | .. | 287 |
| ... | Oats | . | . | 288 |
| ... | Grain-husks | .. | . | 289 |
| .. | Grain-husks | ... | . | 290 |
| .. | Barley and husks | ... | . | 291 |
| . | Oats and husks | .. | . | 292 |
| Potato | Barley | . | . | 293 |
| ... | Grain-husks | .. | . | 294 |
| ... | Barley and husk | . | .. | 295 |
| ... | Grain-husks | ... | .. | 296 |
| ... | do. | .. | .. | 297 |
| . | Oats | .. | . | 298 |
| . | Barley and husks | .. | .. | 299 |
| | Oats and husks | .. | .. | 300 |
| | Grain-husks | .. | .. | 301 |
| | Grain-husks | . | Gizzard contained small stones | 302 |
| .. | Grain and husks | .. | Gizzard contained stone granules | 303 |
| A good deal of potato | Grain-husks | .. | Potato not rotten | 304 |
| A trace of potato | Barley | ... | . | 305 |
| .. | Barley and husks | .. | . | 306 |
| .. | Oat and husks | .. | . | 307 |
| Potato | Black oat and husks | ... | . | 308 |
| ... | Crushed grain | Pieces of sea-shells | . | 309 |
| Potato | Grain-husks | ... | . | 310 |
| .. | do. | ... | ... | 311 |
| ... | Barley and husks | ... | .. | 312 |
| ... | Grain-husks | .. | .. | 313 |
| ... | Grain-husks | ... | .. | 314 |
| ... | Grain-husks | . | .. | 315 |
| ... | Barley | ... | Gizzard contained small stones | 316 |
| ... | Barley and husks | ... | .. | 317 |
| ... | do. | ... | ... | 318 |

rule, and the packing with food was very conspicuous during the time of hard frost towards the end of the month. One gizzard was quite empty, and three almost so.

(Weather up till 12th inst. very hard, and from 19th to 31st.)

37 ROOKS,

| No. | Date. | Hour. | Weather. | Place and Occasion. | Quantity. | Insects, &c. |
|-----|-------|-----------|------------|----------------------|----------------|-------------------------|
| 319 | 1st | 4 p.m. | Hard frost | Montrave, flying | Full | ... |
| 320 | ... | .. | ... | ... | do. | ... |
| 321 | ... | .. | ... | ... | do. | .. |
| 322 | 1st | 5.30 p.m. | Hard frost | Ramornie, on tree | Full | .. |
| 323 | ... | ... | .. | ... | do. | ... |
| 324 | ... | ... | .. | ... | do. | ... |
| 325 | 4th | 11 a.m. | Hard frost | Lundin | Full | .. |
| 326 | ... | ... | ... | ... | Not full | ... |
| 327 | .. | ... | ... | .. | do. | ... |
| 328 | ... | ... | ... | ... | do. | 1 small gasteropod |
| 329 | ... | ... | ... | .. | do. | ... |
| 330 | 6th | 5 p.m. | Hard frost | Ramornie, on tree | Not full | ... |
| 331 | .. | ... | .. | .. | Empty | .. |
| 332 | 6th | 5.30 p.m. | Hard frost | Ramornie, flying | Not full | .. |
| 333 | .. | ... | .. | .. | do. | .. |
| 334 | ... | ... | ... | ... | Almost empty | . |
| 335 | 9th | 3.30 p.m. | Hard frost | Montrave, flying | Full | .. |
| 336 | ... | .. | ... | ... | do. | .. |
| 337 | ... | ... | ... | ... | do. | ... |
| 338 | ... | .. | ... | ... | do. | ... |
| 339 | 11th | 1 p.m. | Hard frost | Upper Pratis, flying | Packed | ... |
| 340 | 13th | 2 p.m. | Hard frost | Hatton, flying | Full | . |
| 341 | 13th | 2.30 p.m. | Hard frost | Hatton, flying | Not quite full | . |
| 342 | 13th | 3 p.m. | Hard frost | Upper Pratis, flying | Full | .. |
| 343 | 13th | 4 p.m. | Hard frost | Upper Pratis, flying | Fairly full | ... |
| 344 | 13th | 5.30 p.m. | Hard frost | Ramornie, flying | Full | .. |
| 345 | ... | .. | ... | ... | do. | ... |
| 346 | ... | .. | ... | ... | do. | ... |
| 347 | ... | ... | ... | .. | do. | ... |
| 348 | 21st | 11 a.m. | Hard frost | Montrave, flying | Not quite full | .. |
| 349 | .. | ... | .. | ... | Full | ... |
| 350 | 21st | 6 p.m. | Hard frost | Ramornie, on tree | Full | ... |
| 351 | .. | ... | .. | ... | do. | ... |
| 352 | 22d | 6 p.m. | Hard frost | Ramornie, on tree | Not full | ... |
| 353 | ... | ... | . | ... | Full | A few insects and grubs |
| 354 | ... | ... | ... | ... | do. | ... |
| 355 | ... | ... | ... | .. | Empty | ... |

Food.—Grain was the food of the month, supplemented in two cases by Indian corn, and in one by a single small gasteropod.

Stones in Gizzard.—These stones, apparently taken to be used for grain-grinding purposes, were noticed in 18 of the 37 rooks shot during the month.

FEBRUARY 1895.

| Roots. | Grain and Husks. | Miscellaneous. | Remarks. | No. |
|--------|-------------------------------|-------------------------------|--------------------------------|-----|
| ... | Barley | ... | ... | 319 |
| ... | do. | ... | ... | 320 |
| ... | Oats and husks | ... | ... | 321 |
| ... | Barley | ... | ... | 322 |
| ... | Grain-husks | Shell-sand | ... | 323 |
| ... | Oats | ... | ... | 324 |
| ... | Oats and husks | ... | Gizzard contained small stones | 325 |
| ... | Grain and husks | ... | do. | 326 |
| ... | Oats and husks | ... | ... | 327 |
| ... | Barley and oat | ... | ... | 328 |
| ... | do. | ... | Gizzard contained small stones | 329 |
| . | Barley and oat-husk | ... | ... | 330 |
| .. | ... | ... | ... | 331 |
| .. | Grain-husks | ... | Gizzard contained small stones | 332 |
| .. | do. | ... | do. | 333 |
| . | do. | .. | do. | 334 |
| ... | Barley and husks | ... | Gizzard contained small stones | 335 |
| ... | do. | ... | do. | 336 |
| ... | do. | Indian corn | do. | 337 |
| ... | Barley, oats, and husks | ... | do. | 338 |
| ... | ... | Indian corn, 90 grain-counted | ... | 339 |
| .. | Barley and husks | ... | ... | 340 |
| .. | Black oats, barley, and husks | ... | Gizzard contained small stones | 341 |
| ... | Barley | ... | Gizzard contained small stones | 342 |
| ... | Grain-husks | ... | Gizzard contained small stones | 343 |
| ... | Barley | ... | ... | 344 |
| ... | Barley and husks | ... | Gizzard contained small stones | 345 |
| ... | do. | ... | do. | 346 |
| ... | Barley, oats, and husks | ... | ... | 347 |
| ... | Barley and husks | ... | ... | 348 |
| ... | Oats and husks | ... | Gizzard contained small stones | 349 |
| ... | Grain-husks | ... | ... | 350 |
| ... | do. | ... | Gizzard contained small stones | 351 |
| .. | Grain-husks | ... | Gizzard contained small stones | 352 |
| ... | do. | Some pieces of flesh | ... | 353 |
| ... | ... | Horse dung | ... | 354 |
| ... | ... | ... | ... | 355 |

Quantity.—Although this was a month of hardest frost, there was very little sign of food poverty. Two gizzards were empty, one almost empty, and six or seven not quite half full. In rook 339 ninety grains of Indian corn were found filling the gizzard.

STARLINGS.

SECTION 1.—NUMBER.

The total number of starlings examined was 190. The table here given shows the number of birds shot each month, and the number of empty birds having no food contents in crop and gizzard:—

STARLINGS EXAMINED FROM MARCH 1894 TO END OF FEBRUARY 1895.

| | 1894. | | | | | | | | | | | | 1895. | | Total. |
|--------------------------|-------|-------|-----|------|------|------|-------|------|-----|-----|-----|-----|-------|--|--------|
| | Mar | April | May | June | July | Aug. | Sept. | Oct. | Nov | Dec | Jan | Feb | | | |
| No of birds examined . . | 28 | 28 | 23 | 15 | 1 | 2 | 13 | 3 | 27 | 5 | 20 | 26 | | | 190 |
| No of empty birds . . | 1 | 0 | 9 | 1 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | | | 15 |

The number of birds with contents is 190 minus 15—that is, 175 birds. When added together, the number of food items found in these birds is 261, and not 175. It is well to note that Lundin Wood is one of the favourite roosting-places of the starlings, thousands of these birds assembling in the spruce wood there every evening.

SECTION 2.—THE STAPLE FOODS.

Although starlings can take and use many and varied articles of food at a pinch, or when special opportunity offers, it is none the less true that the range of staple food-stuffs for this class of bird is extremely narrow; indeed, starlings are most monotonous in regard to diet. All the food-stuffs found in the crops and gizzards examined are conveniently grouped thus: 1, Grubs; 2, Insects, &c.; 3, Cereal grains; 4, Miscellaneous. This arrangement of food-stuffs is to all intents and purposes that for rooks—indeed starling and rook work very similarly in regard to food. The difference is that the starling uses much less grain but a greater deal of insect, that the starling has more of the insectivorous habit.

SECTION 3.—RELATIVE IMPORTANCE OF THE FOODS.

This point is strongly brought out by the following figures, which show the number of times each group of food-stuff has been used:—

| FOOD-STUFFS. | STARLING. | | ROOK. | |
|---------------------|-------------------------------------|------------|-------------------------------------|------------|
| | No. of times taken during the year. | Per cent. | No. of times taken during the year. | Per cent. |
| Grub . . . | 30 | 182 | 116 | 23 |
| Insect . . . | 152 | | | |
| Grain . . . | 58 | 22 | 290 | 58 |
| Miscellaneous . . . | 21 | 8 | 60 | 12 |
| Roots . . . | 0 | 0 | 36 | 7 |
| Total . . . | <u>261</u> | <u>100</u> | <u>502</u> | <u>100</u> |

Speaking roughly, three-fourths of starling-food is insect and one-fifth grain; whereas in the case of the rook one-fifth is insect and more than one-half grain. These figures also show that so far as use of plants for food is concerned, the starling can only be called in question regarding his proclivities for grain, since this is the only crop which he takes and uses.

SECTION 4.—TOTAL INJURIES AND BENEFITS.

In view of the consideration that much, very much, of the comparatively small amount of grain here dealt with must have been got from dung—how much cannot, for various reasons, be precisely stated—the opinion is forced upon us that the starling is a most diminutive bird when regarded as a crop-destroyer; indeed, it is a very slight stretch of truth to say that no blame can attach on this score. But is the bird harmless in other respects, is he the benefactor of the farmer, are we to make much of him, and to foster his spread and multiplication?

The answer to this question must hinge on the relation between starlings and insects. Suppose we find that the majority of insects destroyed by starlings are not beneficial to the farmer, then it is quite right to allow and to favour reproduction. But, on the other hand, if we know that the insects taken as food and destroyed are useful insects, and that these are the majority, it is equally right to prevent the ravage and to stop the spread of the bird. The species of insects actually found must be appealed to, and the number of black or white marks opposite their names will answer the question here propounded.

Mr Mosley, of Huddersfield, names the kinds and species thus:—

USEFUL TO AGRICULTURE.

Rove-beetles (*Brachelytra*)—
Philonthus.
 Ground-beetles (*Geodophaga*)—
Pterosticus.
Notiophilus.
Neleria.
Stornis.
Anchominus.

The grubs are seen to be most freely taken during May, June, and December; but they never come up to the insects in frequency except during the month of December. Grain and husk were specially abundant in the birds during April, November, January, and February.

[TABLES

28 STARLINGS,

| No. | Date. | Hour. | Weather. | Place and Occasion. | Quantity. |
|-----|-------|-----------|----------|---------------------|-----------|
| 1 | 8th | 6 p.m. | Good | Lundin | ... |
| 2 | ... | ... | ... | ... | ... |
| 3 | ... | ... | ... | ... | ... |
| 4 | ... | ... | ... | ... | ... |
| 5 | ... | ... | ... | ... | ... |
| 6 | ... | ... | ... | ... | ... |
| 7 | ... | ... | ... | ... | ... |
| 8 | ... | ... | ... | ... | ... |
| 9 | 14th | 6.30 p.m. | Good | Lundin | ... |
| 10 | ... | ... | ... | ... | ... |
| 11 | ... | ... | ... | ... | ... |
| 12 | ... | ... | ... | ... | ... |
| 13 | ... | ... | ... | ... | ... |
| 14 | ... | ... | ... | ... | ... |
| 15 | ... | ... | ... | ... | ... |
| 16 | ... | ... | ... | ... | ... |
| 17 | ... | ... | ... | ... | ... |
| 18 | 20th | 6 p.m. | Good | Lundin | ... |
| 19 | ... | ... | ... | ... | ... |
| 20 | ... | ... | ... | ... | ... |
| 21 | ... | ... | ... | ... | ... |
| 22 | ... | ... | ... | ... | Empty |
| 23 | 29th | 6 p.m. | Good | Lundin | ... |
| 24 | ... | ... | ... | ... | ... |
| 25 | ... | ... | ... | ... | ... |
| 26 | ... | ... | ... | ... | ... |
| 27 | ... | ... | ... | ... | ... |
| 28 | ... | ... | ... | ... | ... |

MARCH 1894.

| Insects, &c. | Grain. | Miscellaneous. | Remarks. | No. |
|---|--------|----------------|---|-----|
| ... | ... | Earthy matter | This group of 8 starlings contained the following:— | 1 |
| ... | ... | do. | | 2 |
| Grubs and insects | ... | ... | <i>Useful species.</i> | 3 |
| Insect-remnants | .. | Earthy matter | Many small ground-beetles | 4 |
| Insects and 1 mollusc | .. | do. | (<i>Geodophaga</i>)— | 5 |
| Insects, some entire | ... | .. | <i>Nebria brevicollis.</i> | 6 |
| Beetles and fragments | .. | .. | <i>Anchomimus prasinus, &c.</i> | 7 |
| do. | ... | . | Worms' eggs. | 8 |
| | | | <i>Injurious species.</i> | |
| | | | Beetles— <i>Sitones.</i> | |
| | | | Grubs—Tipuloid. | |
| | | | Molluscs—1 shell of <i>zonites</i> . | |
| Numerous fragments of elytra of beetles | .. | ... | This group of 9 birds contained— | 9 |
| do. | ... | ... | <i>Useful species.</i> | 10 |
| do. | ... | .. | Rove-beetles. | 11 |
| do. | ... | ... | Ground-beetles. | 12 |
| do. | .. | ... | Worms' eggs. | 13 |
| do. | ... | .. | | 14 |
| do. | ... | ... | <i>Injurious species.</i> | 15 |
| do. | ... | ... | Beetles— <i>Agriotes obscurus.</i> | 16 |
| Various insects and elytra of beetles | ... | ... | <i>Othiorhynchus.</i> | 17 |
| | | | <i>Helophorus rugosus.</i> | |
| | | | <i>Sitones.</i> | |
| Several grubs, whole and crushed beetles | ... | .. | These starlings contained— | 18 |
| Beetle-fragments | ... | ... | <i>Useful species.</i> | 19 |
| Beetle - fragments, and small spiral - shelled molluscs | ... | ... | Ground-beetles— | 20 |
| Beetle-fragments | ... | .. | <i>Pterosticus.</i> | |
| ... | ... | ... | <i>Notiophilus biguttatus.</i> | |
| | | | <i>Injurious species.</i> | 21 |
| | ... | ... | Beetles— <i>Othiorhynchus ovatus.</i> | 22 |
| | | | <i>Sitones.</i> | |
| | | | Grubs—Wireworms. | |
| | | | Tipuloid larvæ. | |
| | | | Molluscs— <i>Helix pulchella.</i> | |
| | | | <i>Zonites.</i> | |
| Remains of insects and beetles | .. | .. | These starlings contained— | 23 |
| do. | ... | . | <i>Useful species.</i> | 24 |
| do. | .. | .. | Ground-beetles— | 25 |
| do. | .. | .. | <i>Nebria brevicollis.</i> | 26 |
| do. | .. | .. | <i>Notiophilus biguttatus,</i> | 27 |
| do. | . | .. | &c. | 28 |
| | | | <i>Injurious species.</i> | |
| | | | Beetles— <i>Agriotes obscurus.</i> | |
| | | | <i>Othiorhynchus ovatus.</i> | |
| | | | <i>Sitones.</i> | |
| | | | Grubs— <i>Chærus.</i> | |
| | | | <i>Hepialus.</i> | |
| | | | Wireworms. | |
| | | | Tipuloids. | |

28 STARLINGS,

| No. | Date. | Hour. | Weather. | Place and Occasion. | Quantity. |
|-----|-------|-----------|-----------|---------------------|--------------|
| 29 | 2d | 5.30 p.m. | Good | Lundin, in wood | ... |
| 30 | .. | ... | .. | ... | ... |
| 31 | ... | ... | .. | .. | ... |
| 32 | ... | ... | ... | ... | Almost empty |
| 33 | ... | ... | ... | ... | ... |
| 34 | ... | ... | .. | ... | ... |
| 35 | 5th | 7 p.m. | Good | Lundin, in wood | ... |
| 36 | ... | .. | .. | ... | ... |
| 37 | ... | ... | .. | .. | ... |
| 38 | ... | ... | .. | ... | .. |
| 39 | 10th | 7.20 p.m. | Very fine | Lundin, on tree | ... |
| 40 | ... | .. | ... | .. | ... |
| 41 | ... | ... | .. | ... | .. |
| 42 | ... | ... | .. | ... | ... |
| 43 | .. | ... | .. | ... | ... |
| 44 | ... | ... | ... | ... | ... |
| 45 | 16th | 6.30 p.m. | Very mild | Lundin, on tree | ... |
| 46 | ... | ... | .. | .. | ... |
| 47 | .. | ... | ... | .. | ... |
| 48 | ... | ... | ... | ... | ... |
| 49 | .. | ... | .. | .. | .. |
| 50 | 23d | 7 p.m. | Good | Lundin, on tree | ... |
| 51 | ... | ... | ... | .. | Almost empty |
| 52 | ... | .. | .. | .. | • |
| 53 | ... | .. | .. | .. | ... |
| 54 | ... | .. | .. | .. | .. |
| 55 | .. | ... | .. | .. | .. |
| 56 | | . | | | . |

APRIL 1894.

| Insects, &c. | Grain. | Miscellaneous. | Remarks. | No. |
|--|--------------------------|-------------------------------|--|-----|
| Insect-remnants | Barley | ... | ... | 29 |
| Insects, chiefly beetle, 1 or 2 entire | do. | ... | ... | 30 |
| Beetle-fragments | Barley and oat | ... | ... | 31 |
| Beetle-remnants | A few barley-grains | ... | ... | 32 |
| do. | Barley | ... | ... | 33 |
| Insects and beetles | Barley and oat | ... | ... | 34 |
| Insects and beetles | ... | ... | This batch contained— | 35 |
| do. | ... | ... | <i>Useful species.</i> | 36 |
| ... | Partially digested grain | ... | Various small ground-beetles. | 37 |
| ... | do. | ... | <i>Injurious species.</i> Beetles—Sitones. Grubs—Tipula. | 38 |
| Insects and beetles | ... | ... | These starlings contained— | 39 |
| do. | ... | ... | <i>Useful species.</i> | 40 |
| do. | ... | ... | None. | 41 |
| do. | ... | ... | <i>Injurious species.</i> | 42 |
| do. | Some grain-husks | ... | Beetles—Otiorynchus ovatus. Sitones. Grubs—Tipula. | 43 |
| do. | ... | ... | ... | 44 |
| Insects and beetles | Partially digested grain | ... | This set contained— | 45 |
| do. | ... | ... | <i>Useful species.</i> | 46 |
| do. | ... | ... | Small ground-beetles. | 47 |
| do. | ... | ... | <i>Injurious species.</i> | 48 |
| do. | ... | ... | Beetles—Sitones. Agriotes | 49 |
| Beetles and 1 gasteropod | ... | ... | These contained— | 50 |
| ... | ... | A little muddy-looking matter | <i>Useful species.</i> | 51 |
| Insects and beetles | ... | ... | Small ground-beetles. Rove-beetles. | 52 |
| Beetles and gasteropods | ... | ... | <i>Injurious species.</i> | 53 |
| Insects and beetles | ... | ... | Beetles—Aphodius. Agriotes obscurus. Sitones. Grubs—Xylophasia polyodon. Molluscs—Helix rufescens. Helix rotundata. | 54 |
| do. | ... | ... | ... | 55 |
| do. | ... | ... | ... | 56 |

23 STARLINGS,

| No. | Date. | Hour. | Weather. | Place and Occasion. | Quantity. |
|-----|-------|-----------|-----------|---------------------|--------------|
| 57 | 1st | 2 p.m. | Fine | Lundin | .. |
| 58 | ... | ... | .. | ... | ... |
| 59 | .. | ... | .. | ... | ... |
| 60 | 1st | 7.30 p.m. | Fine | Lundin, on tree | ... |
| 61 | .. | .. | ... | ... | ... |
| 62 | 3d | 7.30 p.m. | Cold wind | Lundin | ... |
| 63 | ... | ... | ... | ... | ... |
| 64 | 7th | 7.30 p.m. | Good | Lundin Wood | Empty |
| 65 | .. | ... | ... | .. | do. |
| 66 | .. | .. | .. | ... | Almost empty |
| 67 | ... | ... | .. | ... | Not full |
| 68 | .. | .. | .. | ... | do. |
| 69 | .. | .. | .. | ... | Empty |
| 70 | 10th | 6.30 p.m. | Wet | Lundin, on tree | Empty |
| 71 | .. | .. | .. | ... | do. |
| 72 | .. | ... | .. | ... | do. |
| 73 | .. | ... | .. | ... | do. |
| 74 | .. | .. | .. | ... | Full |
| 75 | ... | ... | ... | ... | ... |
| 76 | 22d | 7 p.m. | Lovely | Lundin, in wood | Empty |
| 77 | .. | .. | ... | ... | ... |
| 78 | 28th | 8.30 p.m. | Wet | Lundin, on tree | ... |
| 79 | .. | ... | .. | ... | Empty |

MAY 1894.

| Insects, &c. | Grain. | Miscellaneous. | Remarks. | No. |
|---|--------|----------------|--|-----|
| Beetles and 1 grub | ... | ... | These contained— | 57 |
| Grubs | ... | ... | <i>Useful species.</i> | 58 |
| do. | ... | ... | Various ground-beetles— Stomis pumicatus. Rove-beetles— Philonthus. <i>Injurious species.</i> Beetles—Sitones. Grubs—36 of Tipula oleracea. Molluscs—Helix rotundata. | 59 |
| Beetles and grubs | ... | ... | ... | 60 |
| Insects and beetles | ... | ... | ... | 61 |
| A number of wireworms | .. | ... | ... | 62 |
| Insects and beetles | .. | ... | ... | 63 |
| ... | ... | ... | ... | 64 |
| ... | ... | ... | ... | 65 |
| Traces of insects ; a few nematode worms | ... | .. | .. | 66 |
| Insects and beetles | ... | ... | ... | 67 |
| do. | . | ... | ... | 68 |
| ... | .. | .. | ... | 69 |
| ... | .. | ... | ... | 70 |
| ... | ... | ... | .. | 71 |
| ... | ... | .. | .. | 72 |
| ... | ... | .. | .. | 73 |
| Insects and fragments | .. | ... | ... | 74 |
| 6 grubs | ... | . | ... | 75 |
| ... | .. | ... | ... | 76 |
| Insect-remnants | .. | .. | ... | 77 |
| Insect-remnants | ... | ... | . | 78 |
| ... | ... | ... | ... | 79 |

15 STARLINGS,

| No. | Date. | Hour. | Weather. | Place and Occasion. | Quantity. |
|-----|-------|--------|-----------|------------------------|-----------|
| 80 | 4th | 9 a.m. | Good | Lundin, on plough-land | ... |
| 81 | ... | .. | ... | ... | ... |
| 82 | 6th | 2 p.m. | Good | Balcormo, on grass | .. |
| 83 | ... | ... | ... | .. | .. |
| 84 | 14th | 1 p.m. | Good | Balcormo | Packed |
| 85 | .. | ... | ... | ... | do. |
| 86 | 19th | 1 p.m. | Good | Lundin, flying | Packed |
| 87 | 21st | 5 p.m. | Good | Lundin, on tree | Full |
| 88 | . | ... | ... | ... | do. |
| 89 | 22d | 9 a.m. | Good | Lundin, on tree | ... |
| 90 | ... | ... | ... | ... | ... |
| 91 | 25th | 1 p.m. | Very fine | Pratis | ... |
| 92 | 25th | 4 p.m. | Good | Montrave | Empty |
| 93 | ... | .. | ... | .. | ... |
| 94 | .. | .. | ... | .. | ... |

1 STARLING,

| | | | | | |
|----|----|--------|------|-----------------|-----|
| 95 | 2d | 4 p.m. | Warm | Lundin, on tree | ... |
|----|----|--------|------|-----------------|-----|

2 STARLINGS,

| | | | | | |
|----|------|------------|------|--------------------|------|
| 96 | 6th | 8 a.m. | Good | Balcormo, on grass | ... |
| 97 | 20th | 12.30 p.m. | Good | Balcormo, on grass | Full |

13 STARLINGS,

| | | | | | |
|-----|------|-----------|-----------|------------------------|-------|
| 98 | 3d | 5 p.m. | Good | Blacketyside, flying | Full |
| 99 | . | .. | .. | ... | do. |
| 100 | 10th | 8 a.m. | Good | Lundin, on tree | Empty |
| 101 | 10th | 9.30 a.m. | Good | Balcormo, on grass | Full |
| 102 | 12th | 7 a.m. | Very fine | Balcormo, on grass | Full |
| 103 | 13th | 6.30 a.m. | Very fine | Balcormo, on old grass | .. |
| 104 | ... | ... | ... | ... | ... |
| 105 | ... | .. | .. | ... | ... |
| 106 | 14th | 8 a.m. | Very fine | Lundin, on tree | ... |
| 107 | 19th | 7 a.m. | Good | Pilmuir, flying | Empty |
| 108 | ... | ... | .. | ... | do. |
| 109 | ... | ... | .. | ... | do. |
| 110 | ... | ... | ... | ... | do. |

JUNE 1894.

| Insects, &c. | Grain. | Miscellaneous. | Remarks. | No. |
|--------------------------------|----------------------|----------------|----------|-----|
| Remains of insects: some grubs | A few oats and husks | ... | ... | 80 |
| Insects and grubs | ... | ... | ... | 81 |
| Insect-remnants | . | .. | ... | 82 |
| do. | ... | .. | ... | 83 |
| Beetles | . | .. | ... | 84 |
| Beetles and grubs | . | .. | .. | 85 |
| Beetles and insects | | .. | . | 86 |
| Insects, beetles, and grubs | . | . | .. | 87 |
| do. | . | .. | ... | 88 |
| Insects, beetles, and grubs | ... | ... | . | 89 |
| Insects, beetles | ... | .. | . | 90 |
| Insects, beetles, and grubs | .. | ... | .. | 91 |
| Beetles and grubs | .. | .. | .. | 92 |
| Beetles | ... | ... | .. | 93 |
| | ... | .. | .. | 94 |

JULY 1894.

| | | | | |
|------------------|---|---|----|----|
| Insects, beetles | . | . | .. | 95 |
|------------------|---|---|----|----|

AUGUST 1894.

| | | | | |
|--------------------------|------------------|---|-----|----|
| Insect-remnants | .. | . | ... | 96 |
| Insects and caterpillars | Some grain-husks | . | ... | 97 |

SEPTEMBER 1894.

| | | | | |
|-------------------------------|-----------------|-----|-----|-----|
| Insects, beetles | Traces of grain | ... | . | 98 |
| do. | do. | .. | .. | 99 |
| .. | . | ... | .. | 100 |
| Insects, beetles, and 2 grubs | ... | .. | .. | 101 |
| Insects, beetles | 4 barley-corns | ... | .. | 102 |
| Insects, beetles | ... | ... | ... | 103 |
| do. | ... | ... | ... | 104 |
| do. | ... | ... | ... | 105 |
| Insects, beetles | ... | ... | ... | 106 |
| .. | ... | ... | ... | 107 |
| ... | ... | ... | ... | 108 |
| ... | .. | ... | ... | 109 |
| ... | ... | ... | ... | 110 |

3 STARLINGS

| No. | Date. | Hour. | Weather. | Place and Occasion. | Quantity. |
|-----|-------|------------|------------|------------------------|-----------|
| 111 | 1st | 12.30 p.m. | Extra fine | Nether Pratis, flying | .. |
| 112 | 5th | 5 p.m. | Good | Upper Pratis, on grass | ... |
| 113 | 26th | 9.30 a.m. | Good | Lundin, on tree | .. |

23 STARLINGS

| | | | | | |
|-----|------|------------|----------------|-----------------------------|--------------|
| 114 | 9th | 12 noon | Good | Upper Pratis, on tree | ... |
| 115 | | .. | .. | .. | .. |
| 116 | 9th | 4 p.m. | Good | Lundin, on tree | .. |
| 117 | . | . | ... | ... | ... |
| 118 | ... | ... | ... | ... | ... |
| 119 | ... | ... | ... | ... | ... |
| 120 | 12th | 12 noon | Good | Pilmuir, on bean-field | ... |
| 121 | 14th | 4 p.m. | Very fine | Lundin, on tree | ... |
| 122 | . | ... | ... | ... | ... |
| 123 | ... | ... | ... | ... | ... |
| 124 | ... | ... | .. | ... | ... |
| 125 | . | ... | .. | ... | . |
| 126 | 15th | 4 p.m. | Fro-ty | Lundin, on tree | .. |
| 127 | 16th | 3.30 p.m. | Fro-ty | Pilmuir, on tree | .. |
| 128 | ... | . | . | ... | Almost empty |
| 129 | .. | .. | . | ... | do. |
| 130 | 26th | 4 p.m. | Lovely, fro-ty | Lundin, on tree | .. |
| 131 | | | .. | . | |
| 132 | | | .. | . | |
| 133 | 28th | 11.30 a.m. | Good | Nether Pratis, on oat-field | Not full |
| 134 | . | .. | .. | ... | do. |
| 135 | ... | ... | .. | ... | ... |
| 136 | . | .. | . | . | .. |

OCTOBER 1894.

| Insects, &c. | Grain. | Miscellaneous. | Remarks. | No. |
|-------------------|-------------|----------------|--|-----|
| Insects, beetles | ... | ... | . | 111 |
| Insects and grubs | ... | ... | <i>Injurious species.</i> Grubs — <i>Agriotes segetum</i> (turnip moth). <i>Tipula oleracea.</i> Beetles — <i>Sitones.</i> | 112 |
| A few insects | More barley | .. | . | 113 |

NOVEMBER 1894.

| | | | | |
|--|----------------------------|----------------------|-----|-----|
| Insects | A little grain-husk | ... | ... | 114 |
| do. | do. | ... | ... | 115 |
| Insects, beetles | ... | . | ... | 116 |
| A little insect-remnant | A good deal of grain-husks | ... | . | 117 |
| Insects | A little husk | ... | . | 118 |
| ... | ... | Muddy-looking matter | . | 119 |
| Traces of insects | Grain-husks | .. | . | 120 |
| ... | Barley | ... | .. | 121 |
| A few insects | Grain-husks | ... | .. | 122 |
| Traces of insects | do. | ... | ... | 123 |
| ... | Barley | ... | .. | 124 |
| Traces of insects | Grain-husks | ... | ... | 125 |
| Traces of insects | Grain-husks | ... | ... | 126 |
| Traces of insects | Barley | ... | ... | 127 |
| do. | ... | ... | ... | 128 |
| do. | ... | ... | . | 129 |
| Insects, beetles | Grain-husks | ... | ... | 130 |
| Insects | Barley | ... | .. | 131 |
| do. | Grain-husks | .. | ... | 232 |
| A few beetle elytra ; pieces of earthworms | 2 barley-corns | . | ... | 133 |
| Insects, beetles | Grain-husks | ... | ... | 134 |
| do. | do. | .. | ... | 135 |
| A little insect | Barley | ... | ... | 136 |

8 STARLINGS,

| No. | Date. | Hour. | Weather. | Place and Occasion. | Quantity. |
|-----|-------|--------|----------|---------------------|-----------|
| 137 | 21st | 3 p.m. | Good | Lundin, on tree | Full |
| 138 | ... | .. | ... | .. | ... |
| 139 | ... | .. | ... | .. | ... |
| 140 | ... | .. | ... | .. | ... |
| 141 | ... | .. | ... | .. | Full |
| 142 | ... | .. | ... | ... | ... |
| 143 | .. | .. | .. | .. | ... |
| 144 | . | . | . | .. | ... |

20 STARLINGS,

| | | | | | |
|-----|------|-----------|------------|-----------------|------|
| 145 | 12th | 3.30 p.m. | Good | Lundin, on tree | ... |
| 146 | .. | ... | . | .. | ... |
| 147 | .. | .. | . | ... | ... |
| 148 | . | . | .. | . | ... |
| 149 | ... | ... | . | .. | ... |
| 150 | . | .. | . | . | ... |
| 151 | 26th | 5 p.m. | Hard frost | Lundin, on tree | Full |
| 152 | ... | .. | ... | . | do. |
| 153 | . | .. | .. | ... | do. |
| 154 | .. | . | .. | . | do. |
| 155 | .. | .. | . | . | do. |
| 156 | .. | . | .. | ... | do. |
| 157 | .. | ... | ... | .. | do. |
| 158 | ... | .. | . | .. | do. |
| 159 | ... | . | ... | .. | do. |
| 160 | ... | .. | .. | .. | do. |
| 161 | ... | ... | .. | . | do. |
| 162 | .. | .. | . | . | do. |
| 163 | .. | .. | .. | . | do. |
| 164 | .. | .. | . | . | do. |

DECEMBER 1894.

| Insects, &c. | Grain. | Miscellaneous. | Remarks. | No. |
|-----------------------------------|--------|----------------|----------|-----|
| Insects, beetles | .. | ... | .. | 137 |
| do. | .. | ... | ... | 138 |
| Insects, beetles, and 2 wireworms | .. | ... | ... | 139 |
| Beetles and grubs | ... | ... | ... | 140 |
| Grubs | ... | ... | ... | 141 |
| Beetles and grubs | .. | .. | ... | 142 |
| do. | ... | ... | .. | 143 |
| Grubs | Barley | ... | ... | 144 |

JANUARY 1895.

| | | | | |
|--|---------------------------|-----------------------|---------------------------|-----|
| Traces of insects | Wheat | A small piece of bone | .. | 145 |
| ... | ... | Cotton-cake | . | 146 |
| Pieces of earthworm, 1 beetle, and 1 spiral gasteropod | 2 barley-corns | A little cake | .. | 147 |
| Insects | ... | Cake | ... | 148 |
| ... | Barley | do. | ... | 149 |
| ... | . | do. | ... | 150 |
| Insects, beetles, and grubs, 1 gasteropod | A little black oat | ... | These birds contained— | 151 |
| Insects, beetles, and grubs | ... | | <i>Useful species.</i> | 152 |
| A few insects | Barley | . | Ground-beetles. | 153 |
| Insects, beetles, and grubs | ... | | Rove-beetles— | 154 |
| ... | Barley—pure | .. | Anchomimus albipes. | 155 |
| Insects, 1 bivalve mollusc | Barley | ... | Notiophilus biguttatus. | 156 |
| ... | do. | .. | <i>Injurious species.</i> | 157 |
| ... | .. | Cake | Beetles—Sitones. | 158 |
| Traces of beetles | Some grain | do. | Otiorhynchus. | 159 |
| Traces of insects | Grain | do. | Grubs—Agriotes segetum. | 160 |
| Insects | A few grains of black oat | . | Typha. | 161 |
| do. | ... | ... | Molluscs—Helix rotundata. | 162 |
| do. | ... | Cake | Pisidium. | 163 |
| do. | .. | ... | | 164 |

26 STARLINGS,

| No. | Date | Hour. | Weather. | Place and Occasion. | Quantity. |
|-----|------|-----------|------------|---------------------|--------------|
| 165 | 16th | 5 p.m. | Hard frost | Lundin, on tree | Almost empty |
| 166 | ... | ... | ... | ... | Fairly full |
| 167 | ... | ... | ... | ... | Full |
| 168 | ... | ... | ... | ... | Not full |
| 169 | ... | ... | ... | ... | do. |
| 170 | ... | ... | ... | ... | do. |
| 171 | ... | .. | .. | ... | Almost empty |
| 172 | ... | .. | .. | ... | Half-full |
| 173 | .. | .. | .. | .. | Not full |
| 174 | .. | .. | .. | .. | Full |
| 175 | .. | ... | .. | .. | Not full |
| 176 | ... | ... | ... | ... | do. |
| 177 | ... | .. | .. | ... | do. |
| 178 | ... | .. | ... | ... | do. |
| 179 | 27th | 5 p.m. | Hard frost | Lundin, on tree | Not full |
| 180 | .. | ... | ... | ... | do. |
| 181 | ... | .. | .. | .. | do. |
| 182 | ... | ... | ... | .. | do. |
| 183 | ... | .. | ... | ... | do. |
| 184 | ... | .. | .. | .. | do. |
| 185 | ... | ... | ... | .. | Full |
| 186 | 28th | 5.30 p.m. | Hard frost | Lundin, on tree | Not full |
| 187 | .. | ... | ... | ... | do. |
| 188 | ... | ... | ... | ... | do. |
| 189 | ... | ... | ... | ... | do. |
| 190 | ... | ... | ... | ... | do. |

FEBRUARY 1895.

| Insects, &c. | Grain. | Miscellaneous. | Remarks. | No. |
|-------------------------------------|------------------------------|---|----------------------------|-----|
| Traces of insects | Gram-lusks | .. | This set of starlings con- | 165 |
| Insects | Barley and oat | .. | tained— | 166 |
| 1 insect pupa | .. | Bean-meal | <i>Useful species.</i> | 167 |
| Pieces of beetles | ... | | Ground-beetles, a few— | 168 |
| Insects, beetles | Grain-lusks | | Notiophylus longuttatus. | 169 |
| do. | Grain, partially digested | | Pterosticus. | 170 |
| do. | Grain, partially digested | . | <i>Injurious species.</i> | 171 |
| Traces of insects | Barley | | Grubs— | |
| Insects, beetles | .. | . | Tipula, 169 in number. | 172 |
| Insects | Barley | . | Xylophasia rurea. | 173 |
| Insects, beetles | . | . | Beetles—Aphodius. | 174 |
| do. | Barley | . | Sitones. | 175 |
| Insects, beetles, &c. | . | . | Diptera—1 pupa. | 176 |
| Insects | . | Ashy matter | | 177 |
| Insects, beetles | | ... | | 179 |
| Insects | .. | Earthy - look- ing matter | | 180 |
| .. | . | Unrecognisa- ble vegetable matter | | 181 |
| Insects, beetles | Barley | | | 182 |
| Insects | . | . | | 183 |
| do. | . | . | | 184 |
| Insects, grubs, some gasteropods | | | | 185 |
| Insects | | | | 186 |
| Insects, grubs | Barley | . | | 187 |
| Insects | Gram, partially digested | . | | 188 |
| do. | .. | Earthy - look- ing matter | | 189 |
| ... | | | | 190 |



Fig. 1.—THE BLACKWELL ON

A CHAPTER OF SHORTHORN HISTORY—EARLY
TYPES OF THE BREED.

By WILLIAM PARLOUR, Croft, Darlington.

NOT the least interesting chapter of shorthorn history is that which relates to the time when business capacity on the part of some, and vanity on the part of others, of the early shorthorn-breeders impelled them to publish portraits of their best and most nearly perfect animals. Too often we have to rely entirely on written descriptions for the early histories of our breeds of live stock; and however faithful these may have been, they do not, for the simple reason that we of necessity adopt widely different standards of comparison, always convey to us the exact impressions their authors intended.

With the shorthorn it is different. We have had preserved to us an extensive, interesting, and valuable collection of animal portraits that, taken together, show more clearly and faithfully than any written description could have done the various stages in the development of the breed from the time it was taken in hand in its unimproved form until that later date when agricultural journals and newspapers took up the work of illustration. With this period it is intended here to deal.

The earliest portraiture of the class referred to dates back to the middle of the latter half of last century. The original Teeswater cattle, the progenitors of the shorthorn of to-day, have been described by many writers as big, hard, coarse, bony, strong-constituted, slow-feeding animals; but to how many do these descriptions call up an image like unto fig. 1, an embodiment of them? The illustration shows an animal coarse and ugly in the extreme, and infinitely better adapted for a beast of burden than for laying on beef—as a matter of fact, the oxen in those days were regularly worked. Yet the owner, Mr Hill of Blackwell, was one of the foremost breeders of his time, and had much more than a local reputation; doubtless this was one of his finest productions. The inscription reads:—

THE BLACKWELL OX.

Rising six years old, bred and fed by Chrstr. Hill, Esq. of Blackwell, in the county of Durham.

Killed at Darlington 17th Dec. 1779 by Mr Geo. Coates, who sold him for £109, 11s. 6d.



Fig. 2.—THE KETTON OX



Fig. 3.—THE DURHAM OX.

| <i>Weight.</i> | | | | | st. | lb. |
|-----------------------------|---|---|---|---|-----|-----|
| Two fore-quarters | . | . | . | . | 76 | 7 |
| Two hind-quarters | . | . | . | . | 76 | 3 |
| Tallow | . | . | . | . | 11 | 0 |
| Total | | | | | 163 | 10 |

N.B.—14 lb. to the stone.

| <i>Dimensions.</i> | | | | | ft | in. |
|--------------------------------------|---|---|---|---|----|-----|
| Height at crop | . | . | . | . | 6 | 0 |
| " at shoulder | . | . | . | . | 5 | 9½ |
| " at loins | . | . | . | . | 5 | 8 |
| " from breast to ground | . | . | . | . | 2 | 1 |
| Length from horns to rump | . | . | . | . | 9 | 3½ |
| Breadth over the shoulders | . | . | . | . | 2 | 10½ |
| " from hip to hip | . | . | . | . | 2 | 10½ |
| Girth before the shoulder | . | . | . | . | 9 | 7½ |
| " behind " | . | . | . | . | 10 | 6 |
| " at the loins | . | . | . | . | 9 | 6½ |

We have here size without quality ; a perfect specimen of the unimproved beast ; the starting-point of the Maynards, Collings, and others ; the rough material from which the shorthorn was evolved. A single glance reveals the real and urgent necessity for improvement, and also brings home to us the splendid physique of the Teeswaters that enabled them to withstand the long course of "in-and-in-breeding" to which they were subjected.

But the Blackwell ox was neither the largest nor heaviest beast of its day, for on February 1, 1786, there was slaughtered in Newcastle the famous red ox belonging to the Earl of Darlington, that at nearly ten years old, and after having been regularly worked until a few months previous to being killed, weighed, alive, 240 stones (3360 lb.), and had a carcass-weight of 199 stones, or 2786 lb. Many of the dimensions of this animal exceed those of the Blackwell ox.

The Ketton ox (fig. 2) exhibits in a marked degree the handiwork of the earliest improvers that claim the title of being shorthorn-men. Compared with fig. 1 there is a wonderful filling-up and levelling of the carcass, a reduction of bone, a straightening of lines, and a general toning down of the grossness of the unimproved animal. As its name implies, it was bred by Charles Colling, and in 1801, when its portrait was painted, was five years old. It has an extraordinary depth through the shoulder, but has a delicate head and neck not at all in keeping with the rest of the carcass. The latter is a common characteristic of early shorthorns.

The Durham ox (fig. 3), one of the best-known animals of the beginning of the century, is of the same type as the pre-



Fig 4 —Com 1 155

ceding one. With his picture the following particulars are given:—

THE DURHAM OX.

To the Rt. Hon. Lord Somerville this print is, with great respect, humbly dedicated by his lordship's most obedt. humble servant, John Day. This wonderful animal, now the property of Mr John Day of Harmston, near Lincoln, was, March 20, 1802, six years old.

Dimensions.

| | ft. | in. |
|---|-----|-----|
| Length from nose to setting of tail | 11 | 0 |
| Height at shoulders | 5 | 6 |
| Girth | 11 | 1 |
| Breadth across the hips | 3 | 1 |
| " " middle of back | 3 | 1 |
| " " shoulders squared | 3 | 1 |
| Breadth of first rib | 0 | 9½ |
| Girth of foreleg below knee | 0 | 9½ |
| From breast to ground | 1 | 6 |
| Between the forelegs | 1 | 5 |

Subscriptions taken for this print in the first year amounted to two thousand and upwards, from whence the public opinion of this beautiful animal may be well ascertained.

This ox is still in a growing and improving state, and weighs, according to the computation of the best judges, 30 score per qr., which is 300 stones, 8 lb. to the stone, or 171 stones, 14 lb. to the stone.

The history of this animal is well known. He was sold to Bulmer of Harmby, in February, 1801 for £140, and resold by him in May to Day for £250. This price included a caravan. Day exhibited him for six years in various parts of England and Scotland, and refused offers of £1000 and £2000 for him. The ox dislocated his hip-bone at Oxford in February 1807, and after lying eight weeks was slaughtered. He must have gained considerably in weight after his portrait was painted, for at ten years old he is said to have weighed nearly 1½ tons as he walked about! His caravan life aided greatly in establishing the popularity of the shorthorn by exciting admiration in those who saw him. He was undoubtedly a grand beast, and, considering his enormous size, a model of quality.

Through the courtesy of Mr Anthony Maynard of Harewood Grove, Darlington, a portrait of the famous bull Comet (155) is given (fig. 4). It is from a fine oil-painting by Weaver, now in this gentleman's possession. Mr Maynard is a grandson of the Maynard of Eryholme who sold to Charles Colling the cow Favourite, and her calf, young Strawberry, destined, in their new home, to become the source of numerous tribes of shorthorns, Comet himself being descended from them. Comet is spoken of as being the most symmetrical bull of his day, not large but splendidly proportioned; his portrait is that of a grand



Fig. 5.—WHITE SHORTHORN HEIFER.

animal. His head and neck, like those of the Ketton and Durham oxen, appear to be slightly feminine, but beyond this he will satisfy all but the most exacting. Looking to the short time that elapsed between the formation of the Ketton herd and the birth of Comet, the latter may well be regarded as a prodigy, and an enduring monument of the masterly skill of Colling and his co-workers.

In fig. 5, a seven-year-old shorthorn heifer, bred and fed by Robert Colling of Barmpton, date 1811, we have another type of animal, or, more correctly, a greatly exaggerated specimen of the preceding type. Here the fat is piled on in great undulating ridges and furrows, until the wonder is how the fine-boned, delicate legs could support the weight that was imposed on them. It is related of this animal that there was a depression in its back amongst the rolls of fat large enough to hold a bowl of punch, and that it was, on more than one occasion, filled and the contents drunk, though by whom history is silent!

These fat-producing animals were not at that time without their value. The common cattle of the country were hard, long-legged, slow growers, and a cross with a shorthorn bull of this character had an extraordinary effect in improving their offspring. The quality of the ordinary cattle has, however, been levelled up since then, and though these fat-producers did good service in their day, there is not now the same use for them, and they are almost extinct.

The illustration of the Newbus ox (fig. 6) serves a double purpose. Like fig. 5, it shows the excessive degree of fatness to which animals could be, and were, fed up, and also the value of the early shorthorns for crossing purposes. This ox was sired by a bull of Charles Colling's, a grandson of Old Favourite, and was out of a "Highland Scotch" (?) cow, which, when fat and slaughtered, weighed only 24 stones 10 lb.—14 lb. to the stone. The outstanding merits of their offspring when used on common cattle was one great cause of the popularity of the shorthorn.

It is necessary to include the Craven heifer (fig. 7) to illustrate a numerous class of animals that exhibited a marked deformity of shape. In this case the sloping rumps and ridiculously small head entirely destroy the symmetry, yet in 1811 the heifer was deemed worthy of having her portrait painted. As usual, a lengthy inscription, of which the following is a copy, accompanies the print:—

THE CRAVEN HEIFER.

To the Most Noble Wm. Spencer, Duke of Devonshire, this engraving of the Craven Heifer, bred and fed by the Rev. Wm. Carr, of Bolton



Fig. 6.—THE NEWBORN OX.

Abbey, near Skipton-in-Craven, Yorkshire, is respectfully dedicated by his Grace's obedt. humble servant, John Wilkinson.

This wonderful animal was four years old in March 1811, and is still in a growing and improving state. She weighs 30 score 17 lb. per quarter—that is, 308 stones 4 lb., 8 lb. to the stone, or 176 stones 4 lb., 14 lb. to the stone.

Dimensions.

| | ft. | in. |
|---|-----|-----|
| Length from the nose to the rump | 11 | 2 |
| Height at shoulder | 5 | 2 |
| Breadth over the back in three different places | 3 | 3 |
| Girth in middle of body | 10 | 2 |
| " over loin | 9 | 11 |
| " of foreleg below knee | 0 | 7 |

The deductions to be drawn from this and similar portraits are—(1) that what are now considered good, or fairly good, cattle were very rare in the early part of the century; and (2) that the type of to-day was not fixed at once, but only after repeated searchings and many failures, owing to erroneous ideas of form prevailing amongst certain sections of breeders. Every shorthorn man was not a Colling, and many false standards of symmetry were erected only to be overthrown, as published portraits fully prove.

It is not a little strange that during all this period nothing was heard of what is now understood by early maturity. "Good cattle are good cattle however long it takes to grow them," was evidently an axiom of the time. The Blackwell ox was six years old, the Ketton ox five, the Durham ox six, the white shorthorn heifer seven, whilst the age of the Newbus ox is not given, but all are long past the time at which cattle can now be profitably sent to the butcher. This important truth was left for the breeders of a later period to demonstrate.

The last illustration (fig. 8) is Bates's Duke of Northumberland (1940), winner of the first prize for all-aged bulls at the first show of the Royal Agricultural Society, held at Oxford in 1839. He has many points of resemblance to Comet, as a comparison of the two pictures will show. The prevailing impression that he gives is quality,—quality in the fine head and neck, in the straight lines of the back and thighs, in the tapering legs, in the evenness of flesh, and in the thick mossy coat. He is one of the animals that for all time will be famous in the history of the breed.

The pictures selected constitute in effect a moving panorama of the progress and development of the breed for the period to which they belong. The rough native cattle are represented by fig. 1. Then came the leaders of the illustrious line of shorthorn-men who toned them down, reduced their size, and added quality; the result of their work is shown in figs. 2, 3, and 4. Closely following, almost contemporaneous, was the



Fig 7 —TUL CLAVEN HFIELD



Fig. 8.—DUKE OF NORTHUMBERLAND 1940.

era of excessively fat cattle, of which figs. 5 and 6 are types; the decline and fall of these animals is not the least interesting event in shorthorn history. Finally, there was the striving for uniformity of shape and evenness of flesh, of which fig. 7 is a distorted specimen, and fig. 8 a good example.

This is as far as the scope of the present article extends, but since then imprudent line-breeding has been exploded with disastrous results, and early maturity has been thoroughly developed. The most successful breeders of the present time are working on strictly commercial principles. What is now required is a rapidly-maturing, strong-constituted, medium-sized animal, and Scottish breeders, whose herds of late have been well to the front, have not been the last to recognise it.

BORDER LEICESTERS.

SHORT NOTES ON THEIR ORIGIN, BREEDING, REARING, AND JUDGING.

By W. S. FERGUSON, Kinnochtry, Coupar-Angus.

ORIGIN.

THE name Leicester is a sufficient indication that the breed originally came from that part of the country of which Leicestershire forms the centre. By the same line of reasoning it might be assumed that the new Leicester, or "Border Leicester," originated somewhere in the counties of Roxburgh, Berwick, Northumberland, or Cumberland. This, however, is not the case. The Border counties can claim to having maintained, and it may be improved, the breed, but to Leicestershire belongs the credit of having evolved the new Leicester, now commonly called "Border Leicester," probably so named because of the fact that the Border counties have for at least three-quarters of a century been the chief home of the breed.

There is no properly authenticated records, so far as I am aware, to show at what exact time in the last century the Border Leicester was actually brought into existence. Doubtless it took years of experimenting by early breeders to establish even a foundation for the new breed. However that may be, there seems to be no doubt that the first great improver, if not the one to whom it owes its existence, was Robert Bakewell of Dishley, in Leicestershire.

There have been many conjectures in regard to Bakewell's methods of crossing and mating, but no actually reliable information has come down to us. It is quite safe, however, to assume that his main foundation was the old English Leicester, which in his time was a large coarse animal, with big bones and rough wool, and probably as unlike the present Leicester as one could imagine. What other breeds of sheep he used, if any, we cannot tell; but certain, at all events, it is that before the middle of last century Robert Bakewell succeeded in turning out a new breed of Leicesters of great excellence, and with which his name will ever be associated. This new Leicester, while in its early

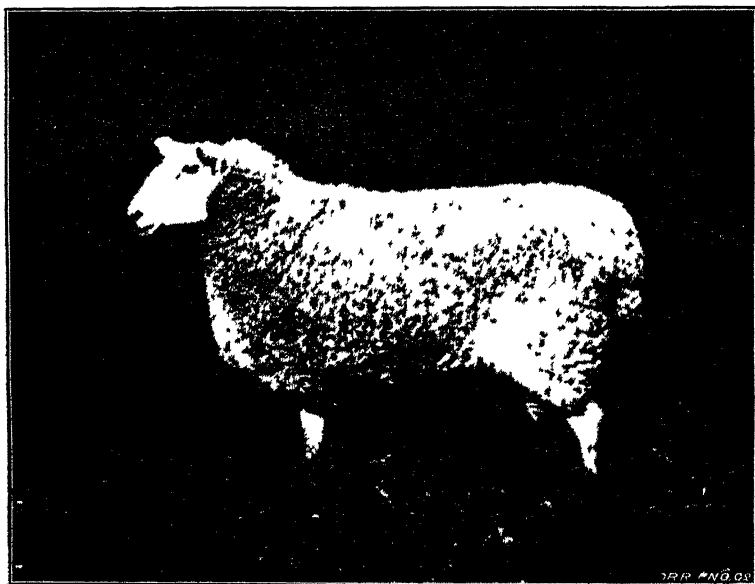


Fig. 9.—BORDER LEICESTER RAM.

days it had nearly all the excellences and characteristics of the breed at present, was not quite of the same appearance. It was of a slimmer make, and not so well developed in any part of the body except the rib. It was also more delicate in feature, and not so well filled in the face; but its potency as a great improver and producer of early maturity, when crossed with other and coarser breeds, was probably as marked in Bakewell's and Culley's time as at the present day.

These and other early breeders did not go unrewarded. The excellence of the breed soon became known, and the sales and lets of Border Leicester rams went up by leaps and bounds, so

that from small beginnings Bakewell and Culley, and their immediate successors, were able during the last decade of last century to sell and let rams at fabulous figures,—£1000 and more having frequently been recorded for the use of individual rams for one season.

MERTOUN FLOCK.

It is not the intention here to refer to either ancient or modern flocks, excepting the premier flock of the present day belonging to Lord Polwarth, without reference to which any



Fig. 10.—BORDER LEICESTER SHEARLING EWES.

article on Border Leicesters would be incomplete. Through the courtesy of Lord Polwarth, and by his Lordship's permission, we are able to give the following from his pen:—

“The system pursued here does not differ materially from that of other breeders, except that I rely on my own flock entirely for sires; and in order to do this without too close consanguinity or loss of constitution, I have increased the flock from what it used to be twenty years ago, and keep a portion on higher and stronger land in East Lothian. This has been helpful in some degree, but perhaps still more is the practice I have now for long adopted of retaining for use in the flock such rams as I

thought most suitable for the requirements of the flock, no matter what their value.

"It is true I have from time to time derived benefit from the repurchase of a ram bred at Mertoun, and which has been in a different climate and on different soil; but it does not do to lay too much stress on this, as the number of lambs thus procured is often small.

"I have great confidence in change of soil, especially for the gimmers, and think the success of a flock depends quite as much on the healthy development of the future matrons of the flock as upon the choice of sires.

"My much-valued friend and manager, the late Mr G. Deans, and excellent shepherd, A. Paterson, to both of whom I am much indebted, were most attentive to the welfare of the ewe flock from its earliest days."

I would only add that the mating and management of the Mertoun flock have been an unqualified success, for instead of diminished demand and reduced prices, the value of the rams seems to increase as the years go on, and all first-class breeders recognise the necessity of periodically drawing fresh blood from this great fountainhead.

BREEDING.

The foundation ewe stock should all be of one family. Without this it will take almost a lifetime to work into the flock a family likeness. If improvements or alterations are to be made, use the rams which reason, experience, and judgment may dictate; but let all changes come from the sire's side unless it be that a false start has been made, and a full clearance and a fresh start become necessary.

It ought also to be remembered that differences of climate, soil, and food have a marked influence on the appearance of animals such as sheep—mostly kept in the open air—and that after a few years members of the same family may cease to have any family resemblance, when such differences exist.

Some lands and localities are noted for growing wool, some bone, some size, some sweetness and quality, some all combined—the last is the place to look for.

Under artificial treatment and house-feeding nature, of course, may be overridden. This does all very well as a hobby or for show purposes, but not as a paying stock-breeding business.

The point which it is desired to put prominently forward here is, that the Border Leicester being a sheep of high quality and rapid growth, and consequently arriving early at maturity, may not judiciously or profitably be kept on every kind of land, or

under any climatic conditions, but that the farmer's first care should be to find out, by experience it may be, whether or not his holding is suitable for this breed of sheep.

Many men who fancy Border Leicesters have not the land to breed them properly or profitably. They may struggle on, and by extra expense keep up with their more favoured brethren; but the sheep which require forcing by any artificial means whatsoever, cannot stand the test alongside those reared under more natural conditions.

The Border Leicester is certainly not a soft sheep, but it is not fit for the same kind of grazing as the Blackfaced or Cheviot. The Shorthorn is not suited for the grazing and conditions of the Highlander, neither is the Aberdeen-Angus adapted for the natural run and feed of the Galloway. Wherever a breeder makes the mistake of putting on the wrong breed of either cattle or sheep, he suffers in pocket and the breed in character and reputation.

Border Leicesters, however, may be, and are, bred profitably under very varied circumstances. Although it may be a generally admitted fact that the part of country best adapted for producing the Border Leicester to perfection is embraced in the counties of Roxburgh, Berwick, and Northumberland, it may at the same time be reluctantly conceded that the south countrymen stand foremost in the science and practice of sheep-breeding. Still, throughout Scotland and the northern counties of England, only more widely scattered, there are many breeders quite as far forward as their Border brethren. In fact, although the ram sales at Kelso are admittedly the centre where the best rams of the breed may be purchased, only a small proportion of the prize sheep at the Highland and Agricultural Society's shows in recent years have been sent from the Border districts.

In breeding Border Leicesters, as in breeding other races of stock, there is no standing still. The breeder must either be going backwards or forwards. Therefore the greatest care is necessary in choosing rams and in mating.

The chief points in a ram are constitution and masculine character. These, with good breeding and general attractive appearance, constitute superlative excellence.

Unfortunately, owing to the old-fashioned ideas and carelessness of breeders, we have, in regard to purity and breeding, to take too much for granted. Surely we might, if we can get no more, have at least a Flock-Book of a modest and modified description—a record officially kept with marks officially recorded, whereby breeders could with some degree of certainty know what they were breeding from. This would be an incalculable benefit to the best and most careful breeders, and would,

without any doubt, greatly increase the value of our best-looking well-bred rams.

There is a strong and spontaneous wish amongst Border Leicester men to have a Flock-Book, and if we are to exist and keep our breed up to date, and according to present-day ideas, we must have this record. The complaint amongst us is, that the foreigner is not going for Border Leicesters; a leading reason is that he has no *book* to go by.

This may seem somewhat of a digression, but it is a most important one, which it is to be hoped may bear fruit.

In the use of rams particular attention requires to be given to proper mating. Generally speaking, the strong points of the one should be used against the corresponding weak points of the other, and by so doing the results will naturally tend towards improvement. Still even the "best to the best" is not infrequently a disappointing combination, calculated to dishearten the inexperienced breeder.

It may, and frequently does, occur that a high-priced, good-looking ram turns out a failure, either because his strain of blood does not *nick* with the flock he is introduced to, or because, although good-looking, he is not so good as he looks, or it may be that a far-back alien strain of blood comes out in his progeny. When such occurs, it goes without saying that the ram should be discarded; and not only so, but if the parent flock is to be kept in family likeness and purity, all the ewe-lambs got by him must be turned off as well.

Nothing tends more to show true and careful breeding than family likeness in the ewe stock, whatever the breed may be. In this connection we hazard the opinion—nay, statement—that no flock, where family likeness is a noted characteristic, is or can be a bad one.

REARING.

The sheep was never meant by nature to be a house-fed animal. Nature gave it a coat to live outside all the year round, and although in our climate it becomes absolutely necessary to make housing provisions for lambing-time, the less sheep are housed the better. Even in the wildest wintery weather good-sheltered fields are all that is required for Border Leicester sheep of every description, except young lambs.

The ewe stock may, with most advantage, in respect to economy and good health, be kept regularly on the pasture-land. In an ordinary winter hand-feeding should not be necessary, except during a frost or snowstorm, at which times in-lamb ewes need careful attention, so that they may not lose strength and vigour as lambing-time approaches. During such hard or violent weather they should have the best shelter at command;

and, along with fodder and a very small quantity of turnips, box-feeding of $1\frac{1}{2}$ to 2 lb., more or less, according to circumstances, is desirable. For this nothing is better or safer than equal parts of linseed-cake, oats, and barley.

In open fresh weather the ewes should give no trouble or anxiety, but during frost and snow neglect is ruinous. If a strong crop of lambs is to be expected, along with ease and satisfaction to the shepherd, the ewes must come to lamb fresh and healthy. Thus, with plenty of milk for the lambs, they go right on to later spring and grass without any more trouble. It may be necessary to give ewes and lambs turnips and box-feeding in early spring before they can get a sufficient bite of grass, but it is not at all necessary nor desirable that lambs meant for breeding purposes should be hand-fed and forced during summer. Too often, however, this is practised: too often for the sake of great appearance, either as lamb or shearling, through excessive summer, autumn, and winter feeding, many of our best rams are utterly ruined for breeding purposes before they have half-way reached maturity.

The Border Leicester is naturally of excellent quality, with a great aptitude to fatten, and it is a very easy thing to overdo it. And *it is* overdone to an alarming extent—to such an extent as to threaten serious injury to the character of the breed.

Time was when well-bred rams in ordinary condition met a ready market, but from year to year the high-pressure system of feeding has become intensified, and both breeder and buyer are the worse for it.

To bring Border Leicester shearlings to sufficient size and good muscular strength without superfluous fat, high feeding is not necessary. Grow them well and muscular without putting on unnatural flabby fat. Give no cake or hand-feeding during the first summer while lambs: a large run and grass as long in autumn and winter as the weather will permit, turnips and hay in moderation according to weather and other circumstances, very little cake at any period of their existence, but peas, beans, oats, and barley instead, and a bite of green tares or second-cutting grass, for two months before selling, will put on all the required appearance and bloom.

Some breeds of sheep require all known arts of feeding to bring them up as shearlings to showyard or sale-ring pitch. Not so the Border Leicester. It is easy to bring it to sufficient size and usefulness as a shearling, and nothing is easier and more often occurs than to overdo and spoil it at that age. Buyers are at fault because they encourage breeders to overfeed. They like to buy something big and blooming to look at for the time being, forgetting that as soon as the first season is over the fine appearance is lost, never to be regained.

Another evil in this connection is, that many hill farmers, for crossing purposes, are being forced to buy Border Leicester lambs instead of shearlings, the best of the latter being grown too big and heavy for use with the small Blackfaced ewes. That this tends to evil most breeders will allow, because it is an impossibility that the produce by animals six months old can, if the system is continued, retain the strength and stamina of animals by more matured sires.

Breeders should attend to this, and endeavour to produce the tight little shearlings so much in demand for crossing purposes; for assuredly the big lumpy ones will go, and are going, out of fashion, except in special cases where the individual flock or animal has some special merit outside that of ordinary breeding.

Those breeders, therefore, who grow most of their rams for crossing—and more than three-quarters of all the Border Leicester rams bred are used for that purpose—might with advantage to themselves and their customers grow the rams lighter and *younger*. In fact it is a distinct saving and advantage to all concerned, if the lambs are made to come as late in spring as it is possible with safety to get the ewes in lamb. The expense of hand-feeding ewe and lamb is thereby greatly reduced; there is less wear and tear on the ewe, as it is the want of milk and strong lambs at foot in early spring that most sorely drags her down, and it is found that when selling-time comes the shearling of sixteen months is more blooming and fleet on his legs than his brother some months older.

In fact, wherever the ewes may be got safely in lamb at a later date, it is certain loss to bring pure-bred Border Leicester lambs so early as January, February, and March.¹

It is unnecessary to devote much space to the ewe-lambs of the flock. They may best be treated in the same way as ordinary mercantile store sheep. Give grass as much as possible both summer and winter, and turnips or other feed when necessary. Let them have sufficient food to grow them big and healthy, but not fat. The tendency of Border Leicester females is to become too fat, so in their younger stages they should be kept down.

A most important matter in breeding, expertness in which can only come from knowledge and experience, is that of drawing the gimmers for keeping. Equal coats, good style, erect ears, white faces and legs, and family likeness, must all be looked for. In condensed words this may be considered the description of the gimmer turned in *on probation*. But more comes after, for on

¹ In case this may not generally be understood, we would point out that low-ground white-faced ewes are mostly off season between January and the following August.

seeing the first crop of lambs, the experienced breeder discards even the young ewes that give any indication of inferiority or lack of character in their lambs, so that in most carefully kept flocks the ewes are not "cast" according to age but by how they breed.

CHARACTERISTICS.

Border Leicesters are not of themselves the best of mutton sheep, except as fat lambs or early hoggets; consequently few of them are kept as ordinary mercantile sheep. Time was when Border Leicester mutton was valuable, and in demand, especially by the English artisan and working classes. But the public taste has changed, and light, lean mutton is now sought by all. So to bring the Border Leicester to meet the public taste would rob the breed of all that makes it famous, and all that keeps it superlatively above all other breeds, as the best producer of that great multitude of cross and half-bred hoggets which constitute the greater bulk of the sheep fed in Scotland.

The leading characteristics of the Border Leicester are substance and quality, aptitude to fatten, large growth, and early maturity. Then it has the power in a wonderful degree—a degree possessed by few other breeds, if any—to transmit these properties to its progeny when crossed with other breeds. For this reason the Border Leicester ram is the ram most largely used in Scotland for crossing purposes.

The greatest demand of all is for crossing "cast" Blackfaced ewes, and by this combination the cross "hogg" or hogget—probably the best mutton sheep in Great Britain—is produced.

The Border Leicester is also generally used in producing the heavier crosses out of Cheviot ewes. This last cross produces a sheep of larger size, coming earlier to maturity, and the produce, commonly called the "half-bred," constitutes a good proportion of the mercantile sheep of the country, more especially in the southern counties of Scotland and in the north of England.

There is, consequently, a great demand for Border Leicester rams; and although other breeds have more or less standing, the Border Leicester holds its place as the low-ground pure-bred sheep of Scotland.

JUDGING.

How fashions change! We look back to the time when the upstanding hard blue-face was quite in showyard running. Then the better quality, more delicate bare-faced "Teeswater," was received with favour. At one period the "fashionable" wool was comparatively close, then it became opener, and more open, and then "wild." Then we gradually came back to com-

mon-sense; nor is it humiliating to admit it. Have not horsemen and cattlemen done the same? Have they not also ridden hobbies to death, and then walked back to the starting-point? With this admission, we believe that our real new starting-point in Border Leicesters is not far from where Bakewell left off.

I believe there was a period of *alteration* in Border Leicesters, and that breeders ultimately found out that no *cross of any kind could improve any established pure breed*, but that a pure breed can only be maintained and improved by introducing fresh *pure* blood of the same breed. This is now an established rule in breeding all kinds of stock. Crossing with other breeds to improve pure-bred stock is out of the question. Thus, we have year by year got more uniformity in Border Leicester type, but not more uniformity in judges' opinions.

The majority of judges have one leading idea, and it is never known until they are finished to what extent they may run. The inexperienced judge takes up one point a-year, to the exclusion of all others; the experienced judge, and the man who knows the sheep, averages the whole animal, *excepting the head*. He cannot get over a rascally head and a bad eye. Probably in few breeds of sheep, and certainly in no breed of horses or cattle, is so much attention given to the head as in Border Leicester sheep, for it is here we can judge most of its character, constitution, and breeding.

A model head is more easily imagined than described. It should be a bold upstanding white head; erect ears; level crown; naturally arched face well filled, with deep jaws, bold eyes, and wide nostrils, denoting strength and vigour,—when such a head is well carried, the animal that carries it will not be overlooked.

The blue-faced, mottled-skinned Border Leicester is a thing of the past; so is the pinky-faced delicate sheep.

The white well-covered head is neither a fad nor a fancy; it is a necessity, as any one who breeds Border Leicesters on high or exposed ground will find. The lambs of this description are much hardier and easier brought up than those of the softer-faced kind.

The black muzzle is also desirable, as indicating hardiness. Still, fancy may here carry one too far, as there is a wide difference between a hardy face without a black nose, and a delicate face with a fleshy nose and pinky eye-setting.

In judging, the first aim is to discard all animals with the least appearance of delicacy, because lack of constitution is a point to be guarded against in all kinds of pure-bred animals.

A Border Leicester ram should be a bold masculine animal, showing vigour and vitality in all his movements; not coarse

and rough-looking in the slightest degree, but possessed of that masculine sweetness which denotes strength with good breeding.

Movement and carriage are also most important qualities. A sheep may be ever so good under the hand when held, but if on letting him go he walks away with head down and long ears wobbling at every step, the judge turns him to his pen. He is a "slutch"—neither vigour nor energy there. A good ram must walk well and gaily, and keep his head up; and he needs to be straight on his legs to do so. The legs should be clean, flat, white, and flinty.

To carry a good head, he must also have a strong neck-vein, and his shoulders must be well set in. A mistake is often made in supposing that a ram must have a thick top neck. He should not! It should only be moderately thick and round—the setting of it to the shoulders and the neck-vein are of more importance than the top. His body is not too long, as great open sheep are out of fashion; and that body should be covered with firm muscular flesh, not flabby fat. The back is perfectly level and straight from neck to tail, and an overhanging tallowy rump is not desirable. The loins are wide and level, and the ribs spring straight from a backbone which cannot easily be felt by the hand, except through a thick pad of firm flesh; and the ribs are round and wide, with the flesh well carried up on them.

Wool is a leading feature. This should be of a "pirly" kind, thickly planted, filling the hand, and showing weight of fleece; and it is desirable that the belly and purse should be fully covered. A good sheep, however, should not be discarded although he may not come up to this standard, as the best and most carefully bred Border Leicesters have a tendency to become "open below," and it is an easy matter to breed rough ones close.

The only deficiencies which, in a judge's eyes, ought utterly to disqualify a Border Leicester sheep are an unpardonable head badly carried and bareness of wool. All other points should, we think, be averaged, not by figures, but in the mind of the judge, who, in arriving at his correct decision, can scarcely tell how it is done. Judging by points is a myth, which may only enter the mind of the amateur who begins late in life to have a hobby for some breed of animals.

In regard to the vexed question of Border Leicester wool, we have said that the present showyard coat is the thick "pirly" one. How far breeders are right in this is open to question. Certainly the closer coat is growing in favour year by year. The serious question is, Should we not discard the "pirly" coat and insist on having the heavy *lustre* wool? It would not pay one to do this while fashion is against it, but we believe that if judges and showing-men would come to an

understanding and favour the heavier coat, it would be an advantage to all concerned. Then we would have few bare thighs and bare bellies amongst our showyard specimens. Moreover, our sheep would become more adapted for export.

These are matters for discussion by a Breed Society, the establishment of which is necessary if we mean to keep our valuable breed of sheep in the forefront at home, and spread them more widely in other countries.

Since the foregoing was written I have received the following notes from Lord Polwarth, and I am gratified to find that his Lordship's views coincide so fully with my own:—

“I have often said to intending breeders, Lay the foundation broad and strong. The future of the flock depends more on constitutional than on fancy points, which can be superadded by careful mating.

“This leads me to remark that I cannot help noticing a lamentable tendency, in shows, to injure our flocks and herds by allowing too much weight to be placed on fancy points. For example, in Border Leicesters, while I freely admit that a black nose is not only a fine set-off to a white face, but to some extent a sign of hardihood, yet many of the most wealthy, hardy, and useful sheep have not got that badge, which some wish to make a *sine qua non*. I do not wish to dwell on this point so much as to use it as an illustration of the danger to all our breeds of running wild at fancy points to the outweighing of general solid merit.

“With reference to the Border Leicester breed, I have no hesitation in saying that there is no breed can excel them for crossing purposes—both for wool and mutton, and especially as turningip sheep. Their extraordinary adaptability to put on flesh rapidly at small cost renders them invaluable as a cross with other breeds.

“At present the public taste is for small mutton, with plenty of lean meat, which are not, I grant, the special qualities of the Border Leicester; but when crossed with smaller breeds, whose tendency is possibly to rather too much of the *lean*, the cross produces our most useful variety.

“At the same time, Leicester breeders may perhaps do well to note the tendency of the times, and aim at excellence of quality rather than excessive weight.

“The importance of the foreign trade should not be lost sight of. Indeed it is one of the few ways we can benefit by the influx of foreign sheep, for we can and should aim at supplying those vast regions with rams. There is a market for suitable stock of untold extent. The foreign buyer requires quality of meat and quality of wool.

“The extensive flocks of merinos are deficient in mutton, but

excel in quality of wool. Our Border Leicesters are admirably adapted for crossing with the merino, but our customers require sheep of moderate size, amply clad in wool of good texture.

“No doubt other breeds are running us hard, and yet we Border Leicester breeders have sheep which are second to none as producers of meat and wool, with the greatest rapidity and at least cost.”

The Border Leicester Ram (aged) and the Border Leicester Shearling Ewes, represented in figs. 9 and 10 (pp. 128 and 129), won for the writer of this paper the first prizes in their respective classes at the Highland Show at Glasgow in 1882, the ram also winning the Tweeddale Gold Medal for the best ram of the breed in the show; while the ewes were again first in their class at the Highland Show of the following year.

IMPROVEMENT OF PASTURE-LAND WITHOUT BREAKING UP.

By JOHN DOUGLAS, Manager, Balker Home Farm, Castle Kennedy.

It is only in comparatively recent years that the question of improving permanent pastures has come prominently to the front. When agricultural depression began to tighten its grip on the farmer, when he found his income getting less and his labour expenses not diminishing but rather increasing, he turned to permanent pasture as one of the ways whereby he might find relief, and began to give it some attention. As a consequence of this the knowledge of the successful management of pasture-land has been greatly increased.

The management of our grass-lands has been, and is, extremely weak, and we cannot reasonably expect them to produce beef, mutton, or milk under ordinary circumstances, and yet maintain their fertility without manurial compensation. There may be different ways of maintaining and increasing their production, and these no doubt vary according to circumstances. In close proximity to the mansions of nearly all our landlords we find a greater or less extent of land lying in permanent pasture, and which—on account of the amenities of the place having to be preserved—must have its fertility maintained or increased without breaking up. In this report we will explain simply and

shortly how a large proprietor in the south-west of Scotland has converted a large extent of very poor grass into good pasture.

Extent, Nature, and Exposure of the Land.

The land to be described is on the Earl of Stair's Wigtownshire estate, and forms part of his home farm of Balker. It is divided into parks, which are in close proximity to Lochinch Castle, and in view of the extensive and beautiful grounds of Castle Kennedy.

The extent of the pasture to be improved was 160 acres, the soil a light brown loam with a gravel subsoil, and requiring no artificial drainage. It lies about three miles from the head of Lochryan in an easterly direction, has a south-eastern exposure, and is 150 feet above the level of the sea. It is intersected by the main approach to Lochinch Castle; the eastern side is bounded by the White Loch—a fairly large expanse of water covering nearly 150 acres—and the western side by woods with a beautifully irregular outline, having many a cosy loop and neuk which afford splendid shelter for cattle or sheep in stormy weather. The side shelter which such judiciously laid-out plantations afford is very valuable for cattle wintering out.

Early History of the Field.

The greater portion—110 acres—of the land under treatment has been in grass for upwards of fifty years, while the other portion—50 acres—was sown down twenty-eight years ago. What mixture of grass and clover seeds was used we have been unable to find out, but it is not likely that natural grasses would have much prominence given to them, because at that time they were not much in vogue. At any rate, an examination of the pastures shows that they contain none of the best grasses.

Nature and Condition of the Grasses and Soil before Improvement.

Professor M'Alpine, who inspected the pastures, says: "The unimproved pastures are composed of *Agrostis* (bent-grass), hard fescue, Yorkshire fog, sweet vernal, a small proportion of clover, and a large quantity of fog (moss). The soil is here in inert condition, and the plants accordingly of innutritious character."

To the ordinary eye the fields were a mass of rough tufted vegetation growing through the fog and creeping-grass—the latter two covering the land like a thick mat, smothering the white clover and finer grasses, and preventing the air from permeating the soil, which consequently lay in a comatose state, unable to perform its work.

The Means adopted to improve the Pastures.

A field containing 50 acres was first taken in hand in 1890, and in the autumn of that year a lot of three-year-old Highland bullocks were purchased and put upon it. The long rough grasses served them as fodder, and in addition they were supplied with a liberal allowance of pulped turnips and chaff, into which was mixed bean-meal at the rate of 2 lb. per head per day. By the spring of 1891 the coarse vegetation had considerably disappeared, and in March the Highlanders were taken off the field so that the fog might be dealt with. Heavy zigzag harrows, well sharpened, were dragged over it again and again until it was completely torn up, and on a dry windy day it was blown across the field in rolls.

The next process was to riddle and thoroughly mix artificial manures in the following proportions—viz.: 2 cwt. bone-meal (foreign); 1 cwt. pure dissolved bones; 2 cwt. superphosphates; 1 cwt. kainit. Instead of applying a large quantity at once, it was deemed advisable to sow 4 cwt. per acre for three years in succession, and this accordingly was the method adopted. So soon as the grass had made sufficient growth, the Highland bullocks were again put on the field and fed with home linseed-cake and undecorticated cotton-cake, mixed in equal proportions, at the rate of 8 lb. per head per day, until they were sold to the butcher on 1st September.

Application of Compost to the Pastures.

A large heap of compost, which had been in preparation for two years previously, was applied to this field in the autumn of 1891. It was composed of roadside scrapings, cleanings from ponds, ditches, &c., mixed with lime, and was spread over 10 acres at the rate of twenty loads per acre. The land was then rolled and harrowed to break any lumps, and also make the distribution as evenly as possible.

Introduction of new Grasses by sowing Seeds.

In the spring of 1892 three acres of the field were severely harrowed, and a mixture of seeds, composed of perennial ryegrass, cocksfoot, timothy, and white clover, was sown at the rate of 12 lb. per acre, and afterwards harrowed and rolled.

Result of the Improvements.

Professor M'Alpine, after carefully examining the field, says:—

“The improved pastures are composed of plants identical in species with those of the unimproved, but the fog (moss) has been considerably diminished and the clover (white) largely

increased in amount. The soil is now working much better, and the plants—better fed themselves—are much more palatable and nutritious for the stock.

“Where introduction of new species of plants by sowing their seeds was attempted, the new plants are scant as compared with the quantity of seed sown. The plants that have *caught* are ryegrass, timothy, and cocksfoot.”

A very beneficial change has been brought about in the soil, for now it has been roused from its dormant state and is actively at work producing pasture of a superior quality in comparison with the useless stuff that formerly grew upon it. The contrast between the unimproved and improved portions is most striking; for the unimproved is a mass of long, coarse, white grass, and the improved dark-hued, close herbage, full of white clover. The amount of white clover which the fields have produced more or less every year since they were improved is a very noticeable result of the operations, and has been commented on by all who have seen it. No doubt the clearing away of the rough vegetation and the breaking up of the fog and creeping-grass are the cause of it asserting itself. The artificial manures, of course, contributed to the result too. It may not be easy or possible by any process of improvement to convert the existing grasses in a pasture into what might be considered more desirable grasses. They can, however, be made more abundant, more palatable, and immensely more nutritious to the stock eating them.

It will be observed that the first attempt to introduce new species of plants by sowing seeds was attended with only moderate success. This was anticipated, because it was observed that when the seeds were sown there was not enough tilth or loose earth to cover them properly, and consequently their chance of brairding was greatly reduced. Another attempt in the same direction was therefore made on 3 acres in another field. The land was again harrowed severely, and afterwards received a dressing of compost, put on at the rate of thirty loads per acre. Then it was harrowed to break the lumps, and the seeds sown at the rate of 20 lb. per acre. Once more the harrows and roller were passed over it and the work was done. This time the seeds brairded thickly, and the results have been satisfactory in every respect. The following was the mixture of seeds used per acre:—

- 40 lb. short perennial ryegrass.
- 6 lb. timothy.
- 4 lb. meadow fescue.
- 3 lb. hard fescue.
- 3 lb. crested dogtail.
- 3 lb. white clover.
- 3 lb. yellow clover.

Increase of Stock on the improved Pastures.

Up to the present (1895) 85 acres out of the 160 have been operated on. The stock consists principally of blackfaced widders which at three years old are killed for Lochinch, and the numbers now are the same as when the improvements began. Since then their average weight under the same condition as to management has been increased, for in

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| 1890 | . | . | . | 80 blackfaced widders averaged 69 lb. |
| 1894 | . | . | . | 80 blackfaced widders averaged 75 lb. |

This shows an average gain of 6 lb. per sheep, which is due to the more nutritious character of the grasses. Previous to 1890 the pastures maintained no cattle, whereas in the winter of 1894-95 twenty Highland and Galloway bullocks were kept on the 85 improved acres, receiving pulped turnips and chaff, and an allowance of 3 lb. undecorticated cake per day. Last summer (1895) ten Galloway bullocks were added to the number; and with the aid of 6 lb. per head per day of home linseed-cake and undecorticated cotton-cake mixed in equal proportions, they had all been sold fat off the grass by the middle of October.

General Remarks.

In the improvement of pastures great prominence is attached to the cultivation of the land, because if the fog or creeping-grasses and weeds have spread a covering over it and shut out the air, it is a waste of time and money to sow manure on it. If any success is to be attained this covering must be torn up; therefore let the harrows be used unsparingly—harrow, harrow, harrow—and fog or no fog, every old pasture is benefited by being harrowed.

The making of compost should not be neglected, for it is a valuable top-dressing; and where it is applied, the pastures soon show its good effects: there the plants are sweet, and there the stock eat constantly and closely.

Nor must the advantage of giving stock on pastures a supply of cake or other rich feeding-stuffs be lost sight of, for by so doing you "kill two dogs with one stone"—you improve the stock and pastures at one operation. Given no untoward circumstance, well-fed cattle and well-fed pastures thrive apace.

It will be seen that the improvement of permanent pastures has been attained without any elaborate or intricate operations, or the expenditure of a large amount of money. On the contrary, the operations have been simple, and the expenditure well repaid.

There is a very large extent of permanent pasture in this

country which is comparatively worthless simply because nothing has been done to maintain its fertility. The land has produced a crop of grass year after year without any manurial compensation, until it has been almost hungered to death. We do not treat our arable land in this way, and our pasture-land will as well repay a little kindness as does arable land.

THE HACKNEY-HORSE.

By HENRY F. EUREN, Secretary of the Hackney Horse Society.

ON the occasion of the Centenary Exhibition of the Highland and Agricultural Society at Edinburgh, in the year 1884, a member of the Council of the Hackney Horse Society visited the show to see the condition of the ride-and-drive horses of Scotland. I had the duty of accompanying him. On the show-ground we met a few gentlemen who were already interested, or who might possibly become interested, in the introduction of the hackney-horse into Scotland. It was then seen that even the most elementary knowledge respecting the trotting hackney was wanting. We had further proof of this in the show itself. The display of Clydesdales was a grand one. There was the poorest possible show of the light-legged horse. The solitary animal which had true hackney action and shape was the stallion Mars 1234.

Thanks to the enthusiasm and patriotism of a few individuals, a very different condition of affairs now exists in Scotland. Men no longer need ask wherein a hackney-horse differs from the sort of animal which used to be accepted as sufficient for riding and driving. There is a strong committee of the hackney-horse breeders in Scotland, who lose no opportunity of educating the public. Competition is keen, by men who own and breed of the best; and the ring-side is enthusiastic when the hackneys are being put through their paces. The time may thus be deemed to have come when a brief statement of the uses and characteristics of the hackney may be acceptable to the readers of this publication.

Old-Time and Modern Uses.

The use of the word hackney is in itself good evidence of the service to which this variety of the horse was put, when as yet history took cognisance only of leaders of men and their wars.

Hackney is simply the Norman-French word which corresponded with the Danish similarly-derived word *nag*. But whereas in all those parts of England, where Danes had settled or ruled, the term *nag* was, as it is even now, applied by the common people to any and every small horse, the pacing and trotting horse, big enough to be adopted by the Norman esquire as his favourite horse, came to be spoken of as his *hackney*. The choice of terms is another illustration of the principle of selection, which Sir Walter Scott puts into the mouth of the Saxon Wamba as a bit of common-folks' philosophy. The trotting horse was in Great Britain long before the Norman, for the Norse folks' horse was, as he is yet, a stout small trotter. It was only when he was adopted by the "fiery French gallant," in those districts where his authority soon became supreme, that he got his French title.

The earliest notice of an Anglo-Norman market—Fitz-Stephen's description of the Twelfth-Century Friday sale at Smithfield, London—distinguishes the ambling nags, with their smooth action, from the horses better adapted for esquires, whose motion is "rougher but yet expeditious." The description of the action of these esquires' horses is that of the trotting *hackney*. Fitz-Stephen then mentions the horses for burden with their "stout and strong limbs." And lastly, "the more valuable *hackneys* and charging-steeds," the *dextrarios*, managed horses, or *equi-militares*, gallopers, as the description sets forth. All these were stallions; for the narrative tells us that the mares, adapted to the plough, the sledge, and the cart, were offered for sale in another part of the field.

The trotter became yet more of a cavalry horse when the introduction of gunpowder into warfare put the man who wore no armour on an equality with the man in a coat of mail. A lighter, more active horse became a necessity for all mounted warriors, and it would seem that this was found in the trotting *hackney*.

One of the consequences of the Wars of the Roses was the need for more attention to the horse stock of the land than had heretofore been given to it. Accordingly, we have a succession of Acts of the Parliaments of Henry VII. and VIII., all intended to improve the horse supply, and, by the conditions imposed, more particularly the horses needed for cavalry. Hence the requirement that no "stoned horse" that was under 15 hands in height should be allowed on commons, forests, moors, or waste grounds; while 14 hands was the minimum height for "stoned horses" pastured on enclosed land. In 1542, the year following this precise regulation, there was an effort, by the 33d Henry VIII., c. 5, to make the breeding of horses one of the requirements that attended on wealth.

In this case there was an important distinction, not found in the Act of the year 1541. That Act applied to all horses, with the declared purpose of securing a "bryde of goode and strong horses." The Act of 1542 applied only to "trotting horses for the saddle." These were declared to be both "liable for the warres, convenient and necessary to be kept and maynteyned by the nobles and other subjects of this realme having any dignitie, estate, possession, or other great substance, for the mayntenance of the same."

Moreover, this Act of 1542 clearly distinguished three varieties of horses as then existing—viz., cart-horses, sumpter-horses, and trotting horses: neither of the first-named two varieties was held to fulfil the conditions of the Act. One of Queen Elizabeth's orders for mustering citizens for training in arms is set forth in the Norwich city records, and we learn from it that the lance or light horseman, and demy-lance or heavy trooper, must have a trotting horse—*i.e.*, a stallion, or a large trotting gelding which might either "trott or rack." This was the description of horse used by Prince Rupert's cavaliers and by Cromwell's Ironsides all through the Civil War. That is proved by a writer, a foreigner, who in England went by the name of Thomas de Grey, and whose experience here was gained in the days of the Protectorate. He declared that "this our island of Great Britain" surpassed all other lands in the spirit, vigour, and doings of its horses, some being as perfect in shape as the coursers of Barbary, Spain, Turkey, and Naples. He asserted that these excellent horses were being applied to racing, and there was danger that the neglect of "the most ancient honour of horsemanship peculiar to the kingdom" would result in a lack of cavalry horses having the "lofty trot" when they would be required, insomuch that, "were we pressed with thoughts of defence, we should be forced to pull horses from the coach and cart to fill up our troops."

It is almost unnecessary to say that this forecast has come true, the ever-recurring lament of cavalry officers being the insufficiency of horses to mount even the men in our cavalry regiments, to say nothing of urgency in case of defence. It can thus hardly be questioned that the first and most persistent use of the trotting hackney of Great Britain was of old as a soldier's horse. It may possibly be within the power of present-day owners and occupiers of land to bring back this use of the hackney for the United Kingdom, if the experience gained elsewhere be followed. But of this more presently.

There can be no doubt that the use of the trotting hackney as a riding-horse followed on its use by esquires. In fact, the one would be a consequence of the other. We have already had mention made of this use in the Act of 1542; but there

is much earlier evidence than this available. College farm accounts, which Professor J. Thorold Rogers has made available, demonstrate that at a farm at Gamlingay near Cambridge, in the fourteenth century, and at a farm at Hickling in Norfolk, in the fifteenth century, it was part of the business of the steward to breed trotting hackneys as well as ambling horses. One of the Acts of Edward III. (A.D. 1340) in restraint of purveyance, also contributes a bit of evidence. While provision for the "king's great horses" was limited to the number declared by the sheriff, the "chief keeper" had at all times the privilege of free quarters for his hackney ("un hakeney" is the wording in the Norman-French statute). Langland in 'Piers Plowman' and Chaucer in the 'Canterbury Tales' severally picture the hackney as the riding-horse of their day, though it may have been that the gait was as often the pace as the trot.

In the days of Queen Elizabeth, in fact, the amble and the "racking pace" were most highly esteemed by the lovers of easy riding; but Master Ralph Blundeville of Newton Flotman, near Norwich, in the first English book on horses that ever issued from the press (in the year 1538), says, "it is not meet for divers respects that horses for service should amble." He evidently knew the trotting hackney well, for he has put it on record that he had known "carriers" to be so "exquisite in their choice of horses as, unless they had beene as comely to the eye as good in their work, they would not buy them." And he asserts that he has seen drawing in carts in his native Norfolk, horses "better proportioned" than he had known "to be finely kept in stables as jewels for the saddle." Moreover, he says that men would "not stick to ride forty, fifty, threescore mile a-day."

It may be taken for fact that by that time (1538) the trotting hackney was the general-purpose horse in Norfolk and its borders, for, when records are next available, it is set down as the ordinary practice to do the farm-work at the trot, where possible—to plough with the trotter in the morning and run a race with the same horse in the afternoon. It must be remembered that Norfolk was then, by its situation, the most progressive of all the counties in Great Britain; and, with the increase of wealth, agriculturists would certainly maintain the pride of selection which Ralph Blundeville mentioned as a characteristic of the men of his day. As yet most of Norfolk and its borders lay in an open, unenclosed condition. The farmer took a grain crop, and when harvest was ended the land was enjoyed by all. For vehicular traffic, down to near the end of the eighteenth century, there were only a few main roads: it was the custom to drive the carts and the lumbering heavy coaches, as most practicable, across the heaths and commons. Market-towns were numerous, and the farmer rode to

market, with the wife on the pillion, as a regular part of the week's work. Defoe, in his *Tour*, affords a vivid picture of the life and animation to be found in Norfolk and its borders. Norwich, he says, had then engaged in its woollen, silk, and wool manufactures 120,000 people; and there was not in 1723 in all the eastern and middle part of Norfolk any hands unemployed if they would work. "The throng of villages," he says, "continued through all the east part of the country. Put it altogether the county of Norfolk has the most people in the least tract of land of any county in England, except about London, and Exon, and the West Riding of Yorkshire." Add to this the further fact that there were then, in the county, owners of large areas who themselves led the way in the improvement of agriculture and all that related to it, and we can realise how favourable were the times for the improvement of the general-purpose horse.

Thus it was that when Eastern, Turkish, and Barb blood were freely introduced, mainly for the gratification of those who had a taste for sport, there was in Norfolk a good foundation of trotting blood on which to rely for the improvement of the hackney. The strongest evidence that can be desired of the will to improve the trotting hackney, is found in the many advertisements of Barb and Arab stallions used in the district. The then Marquis Townsend, as shown not only by advertisements of his Barb Pettigrew, but also by the letters respecting the purchase of this horse and its shipment to England from Gibraltar,—which letters are set forth in a volume of the Royal Historical Manuscripts Commission,—procured a sire for use in Norfolk only, and it would appear he sired only trotters. With such riding-horses for common use, one cannot hesitate to accept the old stories of farmers riding thirty to forty miles to attend Norwich Saturday market, making a large company long before they reached the city, and members of the same clan sitting down together to dinner, thus keeping up the family bonds, though the individuals farmed north, south, east, and west of the city. When such distances were made in the saddle, week in and week out, and the women resorted to the towns, not only to market, but also for enjoyment at the theatre, the assembly, and the rout, it must be assumed that the trotting hackney was then an easy riding horse. The pacing gait was, however, yet existing in some of those bred as trotters; and it is noted of one such stallion, so recently as forty years ago, that he often sired pacers.

The hackney as a harness-horse is a use of comparatively recent times. When the coaching era set in, after Macadam had practically demonstrated the art of road-making, the breeder of the trotter set about meeting the new demand. Coach-horses

were imported into Norfolk from Yorkshire, with a view to the breeding of bigger stock. The result, however, was not satisfactory. It was found that the best results could be got by adding to the trotting blood that of strongly-bred sons of Childers, Croft's Brilliant, and Godolphin Arabian. A stallion got by a grey Barb out of a Scotch mare served in Norfolk two seasons. (Could this have been a Clydesdale cross?) The progeny of these Arabs, and sons of Arabs or Barbs, out of Norfolk hackneys were 15·2-hands horses, declared to be fine coach and waggon horses.

Yorkshire breeders, too, were keen at this time to produce the desired type of harness-horse by a cross of Eastern blood and the trotter. Ultimately one horse with the blood thus combined won the highest repute. This was Shales, a son of Blaze, himself the son of Flying Childers—a pure Eastern-blooded horse—and of the Confederate filly, which had Eastern and Barb blood, mixed both in sire and dam with the blood of mares of unknown breeding. The hackney thus improved was got out of “a strong common-bred mare,” as the only available advertisement worded it, and he was the first of the modern hackneys. The sort of mare then put to Blaze in the district is illustrated by another advertisement, which speaks of the dam of the hackney stallion Hopewell as “noted for trotting.” At any rate, the two sons of Shales known to us were grand impressive sires, which could trot very fast, and were up to heavy weights. One of the two, Scot Shales, had many years of service in West Norfolk and its borders; the other, Driver, left his mark in Yorkshire and the neighbouring parts of Lincoln. The two strains were very soon after joined, but the Driver blood has continued to be the more plentiful in the Yorkshire hackney.

In more recent times the “lofty trot” of the seventeenth-century horse has been highly developed in Norfolk, to meet the taste of those who preferred a showy style of going in the harness-horse. This has, in fact, been done greatly to the detriment of the general usefulness of the hackneys in the county. Happily, since breeders have had abundant means for comparing horses at the London shows of the Hackney Horse Society, they have realised this; and it is a problem that is now being worked out, how to preserve the showy action and at the same time secure the superior shapes of the Yorkshire type.

One other use of the hackney trotter has been freely adopted in foreign lands, though it was first tried in Norfolk. This is the use of the hackney stallion on to light-boned cart-mares, to get a suitable horse for cavalry, carriage, and light-van work. Sixty years ago a 16-hands hackney, Powell's Black Shales, was largely used in this way in North Norfolk, and grand teams were the result: strong, active, well-proportioned horses, fit as

carriage-horses, and the misfits for general farm-work. Most of the horse stock on light lands were probably bred more or less in this way, and nothing could be better adapted for the purpose. Experience is now demonstrating that it is on such lines, rather than by the use of the more massive shire-horse, that the breeder whose land lies on chalk may hope to make farm-horse rearing successful. As to the experience of the foreigner, the late Mr H. R. Phillips, in evidence given before the Select Committee of the House of Lords in the session of 1873, stated that the horses he bought on the Continent, for the autumn manœuvres in 1872, were got by hackney stallions he had exported to France during the previous thirty or forty years, and, though the results of a cross with a Percheron mare, they showed all the characteristics of the hackney sire. M. de Thannberg, who had been the buyer for successive French Governments, even went so far as to trace the successes in the improvement of the French horses to these among other English-bred stallions. Yet more recent illustrations will be cited presently.

The Developed Characteristics.

Such an extended career must needs have developed certain characteristics of action and form, and strengthened those which were inherent. I have suggested that the gait of the hackney was from the very outset a natural trot. This gait, as any one may see by looking at the movement of a number of colts in freedom, is naturally only a more speedy variety of the walk. The trot was so well recognised as the particular gait that was desirable in the hackney intended for the service which men had to render to the State, that, as we have seen, Ralph de Blundeville and Thomas de Grey, in successive generations, were most particular in their advice that the brood mares shall "be of a highe stature, strongly made, large and faire, and have the trotting pace." Norfolk breeders would seem to have been most particular on these matters. Hence the records of trotters, bred and sold off Cambridge College farms in the county in the sixteenth century; and hence, also, the high prices realised for a well-bred horse, described in one of Paston's letters in the year 1476 as "trotting of his own courage, without force of spur." Twenty marks, which would certainly be equal to from £70 to £80 of our money, and "not a penny less," were asked by one of the Norfolk Berneys for such a trotter, which his neighbour Paston required. It must be remembered that even in those early days the hackney had been improved by an admixture of Eastern blood. The Cambridge College accounts show that in 1367 a horse called Hungary was sold—evidently

one of the wiry trotters of the Magyars, which had been imported. Michael Baret, of the Holland district of Lincolnshire—the home of Scot Shales, Pretender, Fireaway, and other first-class hackneys of a hundred years ago—enables us to realise that in those days Barb and Turkish sires were appreciated “for service, swiftness, and proud going, as well as for pleasing pace as gallant trot.” And somewhat later we have William Cavendish, Duke of Newcastle, asserting that “those they call English horses are so compounded of horses of all countries that they always participate something of their sires.”

It is thus seen that the trotting action had in no way been diminished, but rather strengthened in the hackney, in the course of some three hundred years of breeding and selection, by the mixture of the blood of the horses which had been used to improve the shapes of the native horse. Michael Baret even goes so far as to assert that “the stallion begotten of a Barb or Turkey stallion”—valued for its “pleasing pace and gallant trot”—on our English mares, “doth exceed either of them in toughnesse, by reason of the apt composition, of the purity of their substance, in respect of their hot clime, and the humidity of our temperate zone.”

One of the consequences of this admixture of Eastern and English bloods, and of the more regular use of the trotting hackney as a journey horse—with not infrequently two to be carried, and one of the two on a pillion—would seem to have been the production of an easier far-reaching action. This is seen portrayed in John Lawrence’s ‘History and Delineation of the Horse,’ in a picture of Roan Billy, a hackney. It is also well evidenced in the portrait of the wonderful Phenomena mare of eighty years ago; and in the choice print of Douglas, eighth Duke of Hamilton, on his famous Norfolk trotter (fig. 11), the forerunner of the Douglas whose descendants were once so highly reputed in Scotland.

Yet another modification of the trotting action would seem to have been a consequence of the freer use of the hackney as a harness-horse. It then became the aim of the breeder to bring back the “lofty trot” of the old times, though it is certain he was not aware that he was striving after an old-time ideal. This aim was most perceptible in Norfolk. The horse was trained to bend the knee quickly and to lift the foreleg very high, the leg being at the same time thrown well and sharply forward from the shoulder. With this there should have been a smart flexing of the hock, the hind leg being thus well carried forward from the stifle, so that the trotting action should be quick, sharp, and even all round, with the covering of much ground. Unfortunately the hackney, when running a dog-cart or similar vehicle, showed best, in the Park or in a

show-ring, when the front action was extravagantly high. This made too many breeders regardless of the fact that exaggerated knee-action is not infrequently only obtained at the expense of freedom at the shoulder, and at the cost of free hock-action.

There can be no question that the horse known as D'Oyley's Confidence (H. S. B., 158) sired more horses with extravagant action, and its too frequent deterioration of propelling power, than any other hackney stallion; and that the get of Confidence yielded a larger total profit than any other horse of his day.



Fig. 11.—DOUGLAS, EIGHTH DUKE OF HAMILTON, ON NORFOLK TROTTER.

But the present generation of Norfolk breeders has had to suffer the certain consequences of inbreeding to Confidence which was practised for many years; and they may expect, for some time to come, to pay the penalty.

On the other hand, the Yorkshire hackney breeder, by inbreeding to the horses which had inherited the grand all-round trotting action, first of Wroot's Pretender (H. S. B., 596), and subsequently of Bond's Norfolk Phenomenon (H. S. B., 522), secured the less showy but more enduring action, and at the

same time ran less risk of spoiling the development of form and muscle on which beauty of line so greatly depends.

With the institution of the Hackney Horse Society's Stud-Book, and two years after of its annual show, breeders were furnished with the means of mating intelligently, so as to secure as many as possible of the desirable features of the trot with as few as possible of its objections. In other words, the hackney is now recovering its old-time position of being a prime easy riding-horse, while the dash, fire, and great reach forward of the days of his use as a harness-horse are not being omitted. The combination of these latter qualities is so well seen in Langton Performer (H. S. B., 4844), a winner in Yorkshire, then at the Hackney Society's London Show, and more recently of the Junior Hackney Championship at New York, that his portrait is here presented (fig. 14). A photograph has been used by an artist of the Chicago 'Breeder's Gazette' for a fit presentation of this specimen of the hackney as developed in recent years to serve all the purposes of a first-class harness-horse.

The hackney of the present day gets few opportunities of showing how far he retains yet another old-time characteristic—a fine speed, continued for a number of hours. It is fortunate that he has not for many a year, in Great Britain, been in favour for the winning of money by racing. While as yet the hackney was every man's horse, for travel to market and on business, matches against time were not infrequent, and results were obtained which were remarkable. Now, however, the passion for horse-racing is satisfied by the running of thoroughbreds; and the advent of the bicycle will, it is hoped, meet all other people's love for racing against time without calling in the aid of the hackney.

We have, however, on record a noteworthy trial in Kentucky. On December 12, 1893, County Member Junior (H. S. B., 2196) was put into a "top buggy" carrying two men, and was driven from Lebanon, Ky., to Danville and back, a distance of seventy-one miles. The road is described as very rough part of the way; and there were over fifty long hills to be negotiated in each half of the journey, some of which were fully half a mile in length. At the end of the out-journey he rested forty minutes. He was on the road seven hours three minutes, and was reported next morning to be in good condition, as sound as a dollar, and looking ready for another drive. The proper certificates were published at the time in the public press. Instances of the staying power of the hackney are reported from time to time on this side of the Atlantic, but, as they are not public demonstrations, the Kentucky evidence may be deemed to be sufficient.

The walk of the hackney is quite as noteworthy a charac-

teristic as its trot. A riding-horse, whether he was used by a soldier, by the farmer, or by the merchant, must needs be a good walker: hence the hackney has had developed in him a quick even motion when walking. The judges of the hackney are as keen to note the style and rapidity of the horse's walk as they are of its trotting action. In both there must be no evidence of sluggishness, or of a failure to extend the limbs well forward, and with the feet well off the ground. True, the action is not so high as the trot, but it must be similar and as good. Mr Vero Shaw, in his admirable essay on "The Hackney-Horse," to be read in the volume 'Light Horses' (Vinton & Co.'s 'Live Stock Handbooks'), says, "There is no compromise about the true hackney walk, and the possessor of it steps out all round, throwing his front legs well before him, and his back ones right under his body, in a style to make his stride enormous." The importance of establishing a perfect walk in the training of the hackney cannot, in fact, be too highly estimated, for when the horse is being used for pleasure nobody thinks of keeping always on the trot. A hackney that walks truly and speedily is worth much more money than the carelessly trained horse.

The perfect trot and perfect walk are alike evidence of the possession of yet another characteristic—the necessary courage to carry himself as befits a well-bred hackney. We have already seen that this quality was highly valued in the fifteenth century. The horse that "trotted of his own courage without force of spurs" was the hackney worth the money. Gervase Markham, at the close of the sixteenth century, writing on the English horse used by the soldier—which we would remind the reader was at that time a trotting hackney—says of its "inward goodness," or, as we should say, its courage, "For their valure and indurance in the wars, I have seen them suffer and execute as much and more than ever I noted in any other of forraigne extraction." Thomas de Grey's enumeration of the necessary qualities of a good horse, which must be held to be at the foundation of breeding, includes the horse being "well mettled, bold and hardy, of a gentle condition, of a round and comely trot, and pace lightly and well born, obedient mouthed, sure on foot, tough, strong, and easie."

Coming down to our own times, we have the testimony of M. de Thannberg, the French Government buyer already quoted. He was asked to express his opinion on the comparative merits of English and French horses. After remarking, in strong terms, on the deterioration of our horse stock by the present system of racing, and by an entire disregard of the science of breeding in the desire for speed and speed only, he volunteered an opinion on our present-day trotting hackney.

He is quoted by a writer in the 'Edinburgh Review' of October 1873 as saying, "I place the greatest reliance on this breed, for it has been the source of the great amelioration in our horses which has been produced in France. Although these horses are not very high bred, they are of very similar conformation. They invariably transmit to their offspring all their qualities, their action, their courage—in one word, all that constitutes the requisites of a good troop-horse." This independent authority went on to lament that the trotting hackney was "becoming very scarce," a matter which has since been remedied. Several of the witnesses who gave evidence before the House of Lords Committee in 1873 were as outspoken as M. de Thannberg; but, as is well known, the Select Committee yielded no good results, so far as the trotting hackney was concerned.

I may be permitted to say here parenthetically, that before the article appeared in the 'Edinburgh Review' I had begun my self-imposed pleasurable task of preparing the remedy, by gathering the materials for a Stud-Book, and that I broke ground, which to my surprise I found to be unworked, in an article on "Renowned Norfolk Trotting Horses," which appeared in the 'Live Stock Journal' of June 25, 1875. Eight years, however, passed ere the researches were sufficiently advanced to allow of my announcing the issue of such a register; and that at once led to the foundation of the Hackney Horse Society.

Hackney breeders claim that their horses have soundness as a characteristic. Hitherto at the London Show, annually held by the Society, about half the animals exhibited have been sent out for examination as to soundness, and those returned as satisfactory have been more than 96 per cent. The new rule, that came into operation at the Society's Show, March 3d to 6th, 1896, that all horses sent for exhibition must be examined by the veterinaries before coming before the judges, is a yet more arduous test. The results were as follows: 203 stallions passed out of 209 examined, 157 mares passed of 165 examined, and every one of the 28 geldings. The average is 96.5 per cent of all the horses in the Show passed as sound. The aim of the Council of the Society is to ensure that only sound stallions shall be used, and that breeders shall be induced to register only the progeny from mares that are sound. As a further pledge to the public in regard to the soundness of the hackney, it is a condition that no animal may receive the Society's medal at any national, county, or district show unless there be a veterinary certificate of soundness sent to the Society's office.

Mention has already been made of a marked characteristic of the hackney—namely, that when allied with a mare of any other breed, he is so prepotent that the progeny display much of the action and character of the sire. Mr Phillips declared

that, allied with the Percheron (French agricultural) mare, the hackney got troop-horses showing all the characteristics of the sires. M. de Thannberg's statement seems to cover a wider field as regards the mares. The United States has recently been resorted to for a supply of horses for France, with a fixed standard of merit, 15·2 to 16 hands in height, free from hereditary unsoundness, and showing good action. Nearly all the horses thus purchased came from the Western States, and were the progeny of hackney stallions and a trotter or working mare.

In Kentucky and Virginia the hackney is being freely used over trotting and three-parts-bred mares, and the progeny show the characteristic action and shapes of the hackney, while the height of the majority of those shown at three years old has been about 15·2 hands. Mr Henry Fairfax of Virginia, who imported Matchless of Londesboro' (H. S. B., 1517), says the first season of the horse he selected the best available mares to mate with him, agreeing to purchase the foal at a stipulated price. In the autumn following the birth of the foals, he offered at the county fair prizes for the get of Matchless. Twenty-one foals competed, and every one of the foals showed distinctly the characteristics of the sire as well as the hackney type. "The foals showed such shapes and action that the hackney question, so far as Loudoun County was concerned, had been solved." Since this display in 1890 there have been displays at many shows of these first-cross horses, and not an adverse opinion has been heard. On the contrary, at the New York Madison Square Gardens Great Show in November 1895, trotting-horse breeders, who have "not been especially enthusiastic over the hackneys," were captured, as many as twenty mares being booked by one breeding firm for service by Langton Performer. In fact it is now the openly declared intention of the American, by the use of the hackney stallion, to produce the finest carriage-horse the world has ever seen: to say to the English farmer in a few years, "This is what intelligent breeding has done; you are not able to compete with us."

But there is a bit of evidence, too, that in the United Kingdom men are trying what "intelligent breeding" can do. Mr W. R. Trotter of South Acomb, Northumberland, says in the 'Farmer and Stock-Breeder Year-Book' (1896) that he has seen in the North of Ireland a great number of valuable riding and driving horses by Excelsior (H. S. B., 198), nearly all fine goers; and his success at the Royal Dublin Show as the sire of a prize weight-carrying hunter was a crowning achievement. By far the larger majority of the mares whose progeny are thus favourably spoken of were not registered hackneys. In the 'Live Stock Journal Almanac' (1896) Mr Alfred Lomas sets down the results of his trials of thoroughbred, hackney, and

Cleveland, in every possible combination that would ensure Cleveland blood as one-half of the result. His verdict is in favour of mating a three-year-old Cleveland mare the first year with a quality-looking hackney sire (bay colour preferred), with high and extremely good knee-action; the second year with a pure Cleveland sire; and each succeeding year alternately—first the hackney sire, then the Cleveland. He asserts that the deficiencies of the Cleveland mare are made good by the cross of the hackney sire, and also by the stain from the cross. Further, he says the effects of the original first effective service of the hackney sire may be distinctly traced for years in the progeny of the dam. As for the money results, he has not found the cross of the thoroughbred hunter sire, used each successive year, nearly so certain to produce a first-class weight-carrying hunter as the cross of the hackney sire on a Cleveland mare to produce a first-class harness-horse: about 50 per cent would be hunters and the rest blood-like carriage-horses, with medium action, worth 50 to 70 guineas; while the cross of a hackney sire on Cleveland mare would be worth double the amount. These experiences, it must be remembered, are those of men who are not hackney breeders, or interested in the success of the hackney-horse.

The Conformation of the Hackney.

The hackney shape is as characteristic of the breed as the shape of the thoroughbred is of that variety of the horse: once seen it is not forgotten. There must, in the first place, be evidence of a robust and vigorous constitution. This must be combined with the merits which go to make up what is spoken of as quality. And, moreover, there must be the evidences of good temper: at all events, there must be no manifestation of vice such as is shown by some highly-bred horses in the ring. When the detail of form is being considered, the breeder expects in the mare "a long, low, heavily-boned animal which knows how to use her shoulders and bend her hocks"; while by her back-breeding she should be a certainty as a producer of a hackney. There is on record a fair array of stallions which have impressed their own characteristics on nearly all the progeny of every mare covered. Cadet (H. S. B., 1251), son of the first champion mare 289 Princess, bred by Mr H. Moore at Burn Butts, Driffield, Yorkshire, owned for some years by Mr C. E. Cooke of Litcham, Norfolk, and by him sold for 3000 guineas to Mr A. J. Cassatt of Chesterbrook, Pennsylvania, was and is the most individualistic of the present generation of hackney sires. His full-brother, Mr A. Morton's Donal Grant (H. S. B., 1473), yet in Scotland, has evidenced the same pie-

potency on mares of varied breeding both in Norfolk and in Scotland, though in a somewhat less degree than Cadet. Mr Bourdass's Denmark (H. S. B., 177), his son Danegelt (H. S. B., 174), recently owned by Sir Walter Gilbey (having been bought of Mr Bourdass for 5000 guineas), and Mr P. Triffitt's Fireaway (H. S. B., 249), in like manner are famous by reason of the impressing of their character and style on their progeny.

The succession of London Show champion stallions may be expected to give other breeders the chance of following the established rule that "like begets like," for as a rule the champion stallion will be found to have the best back-breeding: where that fails, the horse can hardly be expected to be a success at the stud, no matter how grand a show he may make in the ring. The general description of the hackney which fitted both old style and new ideal is in brief this: "A powerfully-built, short-legged, big, broad horse, with an intelligent head, neat neck, strong level back, powerful loins, and as perfect shoulders as can be produced;" good feet, flat-boned legs, and a height of from 15.2 hands to 15.3½ hands.

The Advantages of Registration.

The breeder of the hackney has now a good many advantages which were denied to those who preceded him so recently as twenty years ago. Then for want of accurate knowledge of recorded back-breeding, the worth of many a stallion had for the most part to be estimated by the statement of the name of his sire, and by his own action and shape. Now there is not only an accurate record, but that extends to the dam as well as to the sire. The breeder of to-day recognises that so much depends on the back-breeding of the mare that he can hardly realise that most Norfolk men, till very recently, held to the practice introduced by the 'General Stud-Book,' and for the most part recognised descent by the direct male line. Yorkshire breeders, fortunately for them and for the hackney interest generally, set down the breeding by maternal descent. In the one case most of the Norfolk pedigrees at the starting of the Hackney Stud-Book were necessarily very much shorter than the Yorkshire pedigrees, which had a full recognition of maternal descent. Students of pedigree, however, saw in the first two volumes of the Hackney Stud-Book that the breeders of fifty to eighty years ago tried to formulate a scheme of scientific breeding by intensifying characteristic merits. They also saw it, when as yet the hackney was not far removed from the earliest proven admixture of Barb and other Eastern blood. Then breeders did not hesitate to resort to other strong currents of the same blood, found in

thoroughbreds, and in unregistered sires which were sons of imported Eastern stallions. But it is not fully realised that this line of breeding speedily produced a 15·3 or 16-hands horse with as much substance as could be desired. Portraits (daubs the artist would rightly term them) of some of these stallions of eighty years ago yet exist as evidence.

Now, happily, competition has introduced the principle of the survival of the fittest male hackneys as sires. Though the breeder's area of selection is thus comparatively limited, he knows that the probabilities of good results are largely increased. In so far the hackney breeder has his way cleared of many hindrances, and he may with a fair degree of confidence hope to raise the standard of merit of his stud. The man who is comparatively unlearned in hackney lore is thus put more nearly on an equality with the man who has spent his whole life in the practice of horse-breeding.

Then the questions suggest themselves, How long may this close breeding, which in very many cases is really in-breeding, be continued without detriment to the hackney? And, Where is the replenishing blood to be found? The Stud-Book conditions now recognise a limited introduction of thoroughbred blood through the sire or dam of the mare. But giving due weight to the assertion made on all hands, and not disputed, that it is rare to find a thoroughbred which has matured and is yet sound, has stamina, good constitution, and the qualities other than speed that used to be found in the thoroughbred, it is a question of importance to hackney breeders whether they may risk the prized characteristics of soundness and substance by even the limited mixture of blood now allowed. May it not be more judicious to revert to the early practice, and reintroduce Eastern blood into the veins of the hackney? The means are at all events at hand in Scotland, Lady Susan Broun's high-caste Arab 13·3 pony stallion St Mirim being "entered" in vol. xiii. of the Hackney Stud-Book. The old-time Barbs were little above pony height, and yet their grandsons were full-sized hackneys.

"Intelligent breeding" will lead a man to work out for himself the pedigrees of his own mares, and of any stallion he may desire to use, to the fourth generation at the least. In this way he may see how nearly he is coming to the rule of good breeding that is followed by one of the most famous of Yorkshire hackney-breeders: "Once away and then back." To see how this rule was applied to produce Denmark 177, Candidate 920 (a London Show champion), Donal Grant 1473, full-brother of Cadet, Danegelt 174, sire of numerous winners, and his son Copenhagen 1461, Reality 665 (thrice a London Show champion), and a number of Yorkshire bred mares, the breeder has only

to turn to vol. iv. of the Hackney Stud-Book, where there are various extended pedigrees; or to the Report of the London Show of 1890, included in vol. viii., for similar extended pedigrees of Rufus 1343 (twice champion), Star of Mepal 1920, and the two most highly honoured mares of the same year—1301 Ophelia, and 1810 Silver Belle. By the study of these extended pedigrees the breeder may also begin to understand the secret of the success of Triffitt's Fireaway 249, and Burnham's Lord Derby 2d 417, among the hackneys which have been lost to us; and the success of some of the younger animals which promise to add yet more to the reputation of the hackney. A few of the old-time stallion pedigrees are also instructively set out in vol. i. of the Hackney Stud-Book. Study of these matters will prove to be of more value than pages of theory.

Notes for Breeders.

The typical hackney brood-mare has been described above as regards her form. The intending breeder will of course carefully scrutinise the back-breeding on both sides, so as to determine the probabilities of merit in the progeny, and also the possibilities of weaknesses or defects being exaggerated by accumulation. Some breeders are of opinion that the progeny gets constitution, stamina, and staying power from the dam; action, bone, strength, and shapes from the sire. Where a stallion is prepotent these latter qualities are found in most of his progeny. That was the secret of the success, from a money point of view, of D'Oyley's Confidence (H. S. B., 158). He gave his action, his rich dark-brown colour, his bone and his shape, to colts and fillies sired by him. Norfolk breeders, in too many instances, were content with the present gain that followed; and the majority were not at all particular in searching out the qualities of the mares used.

So, too, Cadet was by his breeding a most prepotent stallion when used over Norfolk mares, so much so that the influence of Confidence became for a time latent in many of the progeny. This was seen even in the particular of action; the progeny of Cadet, like the get of most Yorkshire horses, developed the true hackney action more slowly than the Norfolk horse. The breeder, who had been accustomed to his hackneys showing all their action when two years old, was undoubtedly disappointed in the progeny of Cadet. This was evidenced by the not infrequently heard observation that Cadet had been a misfortune for Norfolk, because he was losing the action so much valued. Now, however, with the full development of the progeny, this has been found to be a wrong impression.

It is almost unnecessary to remind practical men that there is no special virtue in a pedigree, and that men may, by blundering, have from a well-bred hackney mare only foals which are unworthy of being added to a stud. Hence, while pedigree is closely examined as evidence of value, the qualities of the animals to be mated must be much more strictly scrutinised. From a delicate, weedy-looking mare it would be hopeless to anticipate strongly-built, vigorous progeny. Such a mare, no matter how good her pedigree, finds her proper place among the ordinary workers. Norfolk men have always been very particular about the feet of the hackney: sound, well-formed, and good-sized feet have been recognised as a prime necessity; and this when there has been too little heed to the articulation of the knee-joint, and the value of the desired "plenty of bone" below the knee has been lessened.

It has been already stated that the intelligent breeder does not fail to give due importance to the strengthening of good qualities by attention to line-breeding. There is now such information, available in regard to the second and third generations of stallions, that the breeder may easily learn in what particulars these were strong or weak, and thus forecast the result if he also sets down the back-breeding of his mare to the third or fourth generation.

Coming next to the particular of size. It must be admitted that breeders now like a brood mare to be from 15 to 15·3 hands in height. Fifty years ago hackney-breeders were not in favour of a brood-mare being much over 14·2 hands, save when there was in her veins a strong dash of thoroughbred blood. They held that a mare of that height was best adapted to produce an animal of the true hackney type. It must be admitted that there is much support to the contention to be found in the fact that the Welsh pony mare has in two generations given excellent results, when mated with sizable stallions. The second generation has the staying power, the hardiness, and the vigour of the mountain pony; while, with due care of the young stock, there has been sufficient growth, and 15·2 hands has been the height attained. Some amount of evidence should be available in Scotland on this matter. The late Mr Anthony Hamond some years ago sent to Sir Samuel Scott's Highland estate a good sort of 14·2-hands stallion, registered in the Stud-Book as Bluebeard 91. This horse was used over many of the hill pony mares, and good results were reported. Subsequently another hackney stallion was introduced into the same district, and it is probable that the second generation may now be fully developed. The late Sir John Hay, Lord Arthur Cecil, and more recently Mr Alexander Morton, Mr J. M. Martin, and Mr J. A. Mather, have had experience with pony mares from various districts, so that

intending breeders will not need to begin at the experimental stage should they resolve on breeding up the hill stock of the Highlands and Islands. Mr A. Morton, I am assured, has sold the produce of a hackney stallion and a Scotch pony mare for as much as 200 guineas. Mr George Robb, manager for the Caledonian Railway Co., has also found that the descendants of a roan hackney stallion introduced into the Aberdeen district some years ago have been well adapted for the lighter work of the company as carriers. Similar experimental work to that which has been done in Scotland is being done in the West of Ireland under the direction of the Congested Districts Board, and report says with the most hopeful results.

It is worth mentioning that the Council of the Hackney Horse Society fully realise that pony-breeding is not usually carried out on such precise lines as the breeding of larger horse stock; that more than one stallion may be running free with the mares, and that thus there is less certainty as to the get. Hence they accept, by inspection, as foundation stock, mares of really good shapes which are not over 14 hands in height, when they are fully matured—that is to say, at four years old. This provision enables breeders to make a start with promising material, and on it to build a substantial foundation.

Next comes the important question of age. A good many of the older generation in Norfolk, and several in Yorkshire, bred the mare so that she produced her first foal when she was three years old, and then they gave her a year's rest. The experience of Mr Peacock of Hockwold, which is not surpassed by that of any breeder of hackneys, is that this is bad policy, unless the mare be one of the big sort: even then the progeny will probably be small at birth, and will be small all its days; and the mare's growth will also probably be stunted. Those breeders whose aim it is to breed ponies have in this experience a hint how to proceed. The Hockwold stud, as all hackney-breeders know, was, and is yet, famous for its big upstanding mares. As Confidence 158 sired progeny which seldom exceeded 15 2 hands if a stallion, and 15 hands if a mare, his blood was introduced into the stud only indirectly through Reality. Though both sire and dam had blood derived from the same thoroughbred stallion (Tamworth), Excelsior 198 a stallion thus bred only attained to 15.1 hands. As already mentioned, he was prepotent, and thus got progeny that grew into horses bigger than himself. On the other hand, when Reality was put to Excelsior's grand-dam 200 Lady Kitty, and was thus a generation nearer to the blood that was common to both stallion and mare, the progeny were of full size. The breeder may also get another hint from Hockwold experience. The mare 8 Auntie, dam of Vigorous 1215, produced that horse when she was three years old. One consequence was

that Vigorous measures just under 15·2 hands. The mare herself, when rested and fully matured, grew to 15·3 hands, and then produced to the same sire—Norfolk Gentleman 492—full-sized progeny, Active 1238, sire of Agility 2799, and also Astronomer Royal 1425, well known in Scotland by his get of full-sized horses. That Vigorous had in him the latent energy has been abundantly demonstrated by his getting such a full-sized horse as the Champion Rufus 1343. The policy that is to be pursued, then, is to breed a three-year-old mare, and year after year take a foal from her. The progeny may then be expected to come sound, strong, and full of growth. But the breeder will do well to remember, for what it is worth, Mr Lomas's experience, stated above. If, as he says, he has had demonstrated that the first effective covering of a mare has its influence on the progeny year after year, it is of the first importance to choose the stallion wisely, that is to have such a prepotent influence. Mr Lomas says, "I would impress upon farmers, without considering the amount of the service fee, how requisite it is that this first service should be of the very best sire procurable, having such characteristics—high knee-action, quality, and colour—as are so necessary in young stock."

It is almost unnecessary to say that the mare should, when bred, as nearly approach to a natural condition as is possible. She should not be in hard-working order, or over-fed with corn and stimulating food, but for at least a fortnight before service should have had fresh grass, with a little bran and chopped hay, and a few roots at night. When the mare is in foal she does all the better for gentle regular work up to the day of foaling. She should be kept well, in an open yard, and then the foal may be expected to come better and stronger. The foal, when it begins to eat, should have a quarter of a peck of crushed oats a-day, with a bit of hay and a few kohl-rabi—this root has been found most valuable in the Hockwold stud—and should be kept in an open yard until the grass is fit in May, when, with the dam, the foal goes on the pasture. Yearlings should be treated on the same liberal and natural lines, and if possible should be out on a good marsh, when near the sea-coast, or on pasture inland, from April until the end of October. The strengthening effects of the pure air, and the saline matter which is taken into the system by the young stock kept near the coast, have a material influence on the future of the animal.

If young hackneys are to be shown, the judicious breeder will set his face against the common practice of exhibiting his stock in what is spoken of as "the pink of condition." Judges nowadays are quite capable of correctly estimating the merits of an animal, even though he may not look pretty. Year after year at the London Show a few young hackneys have been seen "as

rough as bears," and yet they have won over highly fed animals in the class. These young animals in their natural condition, though probably they had had rather more generous diet than fell to the lot of their fellows in the same stud, have received no harm from their public appearance, as has been evidenced by their winning in succeeding years. Their competitors, extra well done, as one may put it, have, on the contrary, had all their honours on their first appearance, and their future prospects have been seriously damaged. Should the matured animal be under preparation for the show-ring, the aim should be to furnish as much muscle with as little superfluous flesh as possible. One of the best shown horses in London was the Champion M.P. (H. S. B., 1852): he was sent into the ring "as hard as nails," and yet in "the pink of condition." This was the result of plenty of exercise over the roughest land that could be found in the district. The American practice of exercising hackneys in double harness has also great advantages, and it certainly improves the action of a horse that has not had it well developed.

When the young hackney is being trained to his paces, the best course is to give him his head, using a snaffle-bridle. In this way good speed may be combined with good action. The present generation of hackney-breeders need to be reminded that their grandfathers did not know the curb-bit, and they got excellent action out of their horses. Some clever breeders, who had won a reputation before a stud-book had been thought of, used to urge their young trotters to exercise in a large, well-littered yard, and supposed they developed their action in that way. High action must, however, be to a large degree a matter of inheritance: the most a man can hope for is to regulate it so as to make it as true as possible, and to use all the means he can think of, or which he can glean from others, to develop the inherent quality.

It has already been mentioned that the various uses of the hackney have demonstrated its value as a getter of troop-horses. In the Punjab this has been largely evidenced in recent years, the hackney having been used over native mares which had been accepted by inspection as fit for such service. So far as has yet been recorded there has been no trial of the hackney-Clydesdale cross. That would seem to promise good results. If a young mare has less feather than is deemed the correct thing in a cart or trolly horse, but has good flat bone, good feet, and a good constitution, the probability is she would produce to hackney service a useful foal, which, if it showed quality, might be trained as a carriage-horse, and certainly would be saleable for light van-work, which is a growing line of business that demands much horse stock. The supply of troop-horses will, one may suppose, continue to

be the last resource of the breeder of stock, so long as wretched prices are offered, and the authorities fail so to organise their system as to come into direct communication with the breeder, and secure to him all the money available. Yet one cannot fail to note, when looking at a troop of cavalry, that the horse most needed is he that has free action, plenty of bone and substance, and great hardiness. These are characteristics which may of a surety be acquired by such a cross as has been just suggested. The British farmer may well ask the question, If hackney on Percheron serves the French so well, and if Germany, Italy, and Spain are using similar means for furnishing cavalry horses, what is to hinder in our own country? So far as can be discovered, the particular hindrance is the ignorance of men who know very little of the past history of the horse. They have a record in the General Stud-Book, and suppose that that means the whole of what is worth having in the British horse. The hackney-breeder does not wish to minimise the value of the thoroughbred, when he can discover one that is sound and equal to the record of his breeding; nor does he claim that the hackney is all that can be desired. It is sufficient for him to ask that this newly-recovered British breed shall have a fair trial and no favour. The result, he believes, cannot fail to be satisfactory.

Illustrations of Breeding.

As illustrations of the results of different methods of breeding, portraits of a few noted animals, with details of their pedigrees, are introduced here.

[TABLES.

THE HACKNEY-HORSE.



Fig. 12.—*Hackney Stallion Danegelli 174.*

DANEGELT 174.

Foaled 1879; colour, chestnut; height, 15·2 hands. Bred by Francis Rickell, Warter-on-the-Wold, Pocklington, Yorkshire. Owners in succession: George Bourdass, Hunmanby, Yorkshire; Sir Walter Gilbey, Bart., Elsenham, in whose possession he died January 1896. Danegelt was in his later years the most successful of hackney sires. When all his progeny are recorded in the Stud-Book they will number some 750, the total to the close of vol. xii. being 721. The portrait (fig. 12) is from a photograph from life by C. Reid of Wishaw.

| | | | | |
|----------------------|--|---|--|---|
| DANEGELT 174. | DENMARK 177. | SIR CHARLES 708. | Performer 550. | Phenomenon 573 by Wildfire 864 by Fireaway 208. |
| | | | 3d Dam. | 4th dam by Merrylegs 449. |
| | | 3d Dam. | Merrylegs 449 by Performer 54 by Pretender 596. | |
| | | | 4th dam by Alfred (<i>th.</i>) by Filho de Puta (<i>th.</i>) | |
| | | 2d Dam. | Merryman 1309. | Merrylegs 449. |
| | | | 4th dam by Fireaway 208. | |
| | 257 NELLY. | 3d Dam. | Fireaway 208 by Fireaway 203 by Fireaway 201. | |
| | | | 4th dam by All Fours (<i>th.</i>) by Hyperion (<i>th.</i>) | |
| | | ST GILES 687. | Wildfire 867. | Grey Wildfire 865 by Wildfire 864. |
| | | | 4th dam by Black Overton by Alexander (<i>th.</i>) | |
| NELLIE. | Priority Lass. | Merrylegs 449. | | |
| | | 4th dam by Wildfire 864. | | |
| | Napoleon 465. | Scott's Roan 1147 by Shakespeare 698 by Norfolk Phenomenon 522. | | |
| | | 4th dam by Merrylegs 449. | | |
| 3d Dam. | Brown Shales 102 by Black Shales 83 by Marshland Shales 435. | | | |
| | | 4th dam by Atlas by Atlas (<i>th.</i>) | | |



Fig 13 —*Hackney Stallion FRID MARSHAL 2986*

FIELD-MARSHAL 2986.

Foaled 1889; colour, bay; height, 15.2 hands. Bred and owned by H.R.H. the Prince of Wales, K.G. Illustration of the progeny of a Yorkshire stallion, Norfolk mare. The portrait (fig. 13) is from a drawing from life by Debreë.

| | | | | |
|----------------------------|-------------------------|---------------------------|-------------------------|---|
| FIELD-MARSHAL 2986. | CADET 1251. | LORD DERBY 2d 417. | Lord Derby 415. | Performer 549 by Atlas 892. |
| | | | | 4th dam by Joseph Andrew 1016 by Norfolk Phenomenon 522. |
| | | | 488 Nancy. | Achilles 2 by Fireaway 223. |
| | | 289 PRINCESS. | | 4th dam by Phenomenon 573 by Wildfire 864. |
| | | | Denmark 177. | Sir Charles 768 by Performer 550. |
| | | | | 4th dam by Merryman 1309 by Merryleg, 449. |
| | 1039 BROWN BENS. | CONFIDENCE 158. | Prickwillow 614. | Fireaway-Prickwillow 229 by Prickwillow 607. |
| | | | | 4th dam by Norfolk Hero 499 by Norfolk Hero 495. |
| | | 3d Dam. | | Highflyer 360 by Flying Buck 280. |
| | | | | 4th dam by Grey Norfolk Hero 355 by Norfolk Hero 495. |
| | | 1020 BLACK BEAUTY. | Model 2d 460. | Washington 852 by Shepherd F. Knapp. |
| | | | | Merrylegs by Robin Hood 676 out of 5th dam by Little Tom 408. |
| | | 3d Dam. | | Highflyer 362 by Shales 738 out of 5th dam by Champion 123. |
| | | | | 4th dam by Bellfounder 63 out of 5th dam by Black Shales 84. |



Fig. 14.—*Hackney Stallion Langton Performer 4844.*

LANGTON PERFORMER 4844.

Foaled 1892; colour, chestnut; height, 15.3 hands. Bred by Arthur Hall, East Farm, Langton, Malton. Owners in succession: F. F. Bladon, Sutton-on-Hull, and F. E. Stevens, Maplewood Farm, Attica, New York, U.S.A. He won the Junior Championship of New York Horse Show, November 1895. The portrait (fig. 14) is from a photograph by Schreiber, drawn on the block by Hills.

| | | | | |
|--------------------------------|---------------------------------------|---------------------------------------|-------------------------------|---|
| LANGTON PERFORMER 4844. | GARTON DUKE OF CONNAUGHT 3009. | CONNAUGHT 1453. | Denmark 177. | Sir Charles 768 by Performer 550. |
| | | | | 4th dam by Merryman 1309 by Merryleg, 449. |
| | | 114 Fanny. | | Fireaway 249 by Achilles 2. |
| | | | | Polly by Bay Phenomenon 898 out of 5th dam by Prickwillow 624 |
| | | 2168 LADY COOK. | Lord Derwent 4th 2554. | Lord Derwent 418 by Denmark 177 out of 5th dam Lady Mary by Sir Edwin Landseer 773. |
| | | | | 91 Eclipse by Eclipse 191 by St Giles 687; 5th dam by Sir Charles 768. |
| | 2767 FUSEE 2D. | MARCHESSE OF LONDENBORO' 1517. | 468 Lady Lyons. | Bay President by President Junior. |
| | | | | 99 Evening Star by Wildfire 866 out of 5th dam Jet by Fireaway 222. |
| | | 1122 FUSEE. | Lord Derby 2d 417. | Denmark 177 by Sir Charles 768. |
| | | | | 257 Nelly by St Giles 687; 5th dam Nellie by Napoleon 465. |
| | | | | Lord Lyons 419 by King Charles 392 out of 5th dam by Lord Derby 415. |
| | | | | Flora by Sir Charles 768. |
| | | | | Lord Derby 415 by Performer 549. |
| | | | | 488 Nancy by Achilles 2 out of 5th dam by Phenomenon 573. |
| | | | | Lord Cardigan 1824 by King Charles 392 out of 5th dam by Performer 549. |
| | | | | Prod by Prickwillow 607 by Norfolk Phenomenon 522. |



Fig. 16 — *Hackney Mare 5241 DEARIST (when two years old).*

5214 DEAREST.

Foaled 1891; colour, chestnut; height, at two years old 15 hands, in March 1896 15·2 hands. Bred by J. D. Robinson, Warren Farm, Sledmere, York. Owner, James Walker, Limefield, West Calder. Illustration of the progeny of a Norfolk stallion, Yorkshire mare. Dearest won the Hackney Horse Society's gold medal at the Edinburgh Show, 1895. The portrait (fig. 15) is from a photograph by C. Reid, Wishaw, taken at two years old.

| | | | | |
|---------------|-------------|---------------------|------------------------|---|
| 5214 DEAREST. | RUFUS 1843. | VIGOROUS 1215. | Norfolk Gentleman 492. | Great Gun 326 out of 200 Lady Kitty. |
| | | | | Countess by Ambition 26 out of 200 Lady Kitty. |
| | | | 8 Auntie. | Norfolk Swell 529 by Perfection 541. |
| | | | | 365 Wild Rose by Great Gun 325; 6th dam 200 Lady Kitty. |
| | | 200 LADY KITTY. | Quicksilver. | Performer 552 by Prickwillow 607 by Norfolk Phenomenon 522. |
| | | | | 4th dam by Wentworth (<i>th.</i>) |
| | 1521 ERICA. | 103 FAUNY. | | Tamworth (<i>th.</i>) |
| | | | | Kitty by (?) Shales 726. |
| | | DENMARK 177. | Sir Charles 768. | Performer 560 by Phenomenon 573. |
| | | | | 4th dam by Merrylegs 449. |
| | POLLY. | 3d Dam. | | Merryman 1309 by Merrylegs 449. |
| | | | | 4th dam by Fireaway 208. |
| | | Black Fireaway 905. | | British Champion 914 by Scott's Roan 1147. |
| | | | | 4th dam by Norfolk Phenomenon 522. |
| | | Jet. | | Cato (<i>th.</i>) |
| | | | | |



Fig 16 —*Hackney Mare 6559 DANISH LADY.*

6559 DANISH LADY.

Foaled 1887; colour, chestnut; height, 14-3 $\frac{3}{4}$ hands. Bred by Alfred Simpson, Allerthorpe, Pocklington. Owners in succession: Tom Jay, Putney; C. E. Galbraith, Ayton Castle, Ayton. Illustration of Yorkshire hackney with an out-cross of unregistered blood, three-parts thoroughbred. Danish Lady won the Hackney Horse Society's medal and premium at the Highland and Agricultural Society's Show at Dumfries, 1895; and was the reserve for the challenge cup at the Hackney Horse Society's London Show, March 1896. The portrait (fig. 16) is from a photograph by C. Reid, Wishaw.

6559 DANISH LADY.

| | | | | |
|-----------|---------------|------------------|------------------|---|
| 3757 FAN. | DANEGETT 174. | DENMARK 177. | Sir Charles 768. | Performer 550 by Phenomenon 573. |
| | | | | 4th dam by Merryleg 449. |
| | | | 3d Dam. | Merryman 1309 by Merryleg 449. |
| | | | | 4th dam by Fireaway 208. |
| | | 257 NELLY. | St Giles 687. | Wildfire 867 by Grey Wildfire 865. |
| | | | | Priory Lass by Merrylegs 449. |
| | | | Nellie. | Napoleon 465 by Scott's Roan 1147. |
| | | | | 4th dam by Brown Shales 102. |
| | PLUTO 590. | Bay President. | | President Junior by Bay President (th.) |
| | | | | |
| | | 99 Evening Star. | | Wildfire 866 by Grey Wildfire 865. |
| | | | | Jet by Fireaway 222 out of Douthwaite by Performer 547. |
| | 2d DAM. | Wildfire 868. | | Fireaway 242 by Fireaway 239. |
| | | | | 4th dam by Wildfire 867. |
| | | 3d Dam. | | Sir Charles 768 by Performer 550. |
| | | | | 4th dam by Performer 550. |



Fig 17 —*Hackney Mare 6367 ALDAGIA*

6367 AUDACIA.

Foaled 1892; colour, chestnut; height, 15½ hands. Bred and owned by Alexander Morton, Gowanbank, Darvel. Illustration of progeny of in-bred Yorkshire stallion and Yorkshire mare. Audacia won the reserve for the Hackney Horse Society's cup at the London Show, 1895; and was winner of the same Society's medal and premium Edinburgh Society's Show, 1895. The portrait (fig. 17) is from a photograph by Brown, Lanark.

| | | | | |
|---------------|-------------------------|--------------------|-----------------|---|
| 6367 AUDACIA. | GOLDFINDER 6TH 1791. | DANEGELT 174. | Denmark 177. | Sir Charles 768 by Performer 550. |
| | | | | 4th dam by Merryman 1309 by Merrylegs 449. |
| | | 257 Nelly. | | St Giles 687 by Wildfire 867. |
| | | | | Nellie by Napoleon 465 out of 5th dam by Brown Shales 102. |
| | 742 LILY OF THE VALLEY. | Denmark 177. | | Sir Charles 768. |
| | | | | 4th dam by Merryman 1309. |
| | | 76 Crompton Bay. | | St Giles 687. |
| | | | | 4th dam by Tom Thumb 830 out of 5th dam by Merrylegs 449. |
| | 675 HEATHERBELL. | LORD DERBY 2D 417. | Lord Derby 415. | Performer 549 by Atlas 892. |
| | | | | 4th dam by Joseph Andrew 1016 by Norfolk Phenomenon 522. |
| | | 488 Nancy. | | Achilles 2 by Fireaway 223. |
| | | | | 4th dam by Phenomenon 573 by Wildfire 864. |
| | | 1314 POLLY. | Sir Harry 780. | Sportsman 796 by Prickwillow 624. |
| | | | | 4th dam by Gregson. |
| | | 3d Dam. | | Primo 1107 by Wildfire 867 out of mare by Cadman (<i>th.</i>) |

DOUGLAS.

The Douglas hackney, mentioned in a preceding page, was owned by the eleventh Duke of Hamilton. He ultimately presented the horse to his friend Colonel Cochrane, who described him to Mr W. Munro of Marchbank, Balerno, Mid-Lothian, as a Norfolk trotter of remarkable style and pace. Mr Munro says, "What the Darnley Arabian or Flying Childers was to the English turf the old Douglas was to the trotting world round Glasgow."¹

But there was an earlier hackney of as great reputation for endurance. This horse of just a hundred years ago was a favourite of Douglas, eighth Duke of Hamilton. A scarce print represents the Duke on this famous Norfolk trotter. The inscription on this print, reproduced in fig. 11 (p. 152), is as follows—viz., "His Grace the Duke of Hamilton and Brandon, &c. Published Oct. 15, 1797, by G. Gerrard, London. Painted by G. Gerrard. Engraved by W. Ward." Mr Munro, ten years ago, kindly made inquiries for me respecting this horse, and as his letter contains a bit of local horse-lore, I venture to reproduce it. Mr Munro says:—

"Duke Douglas of Hamilton was born in July 1756, succeeded in 1769, and died in August 1799, in the forty-fourth year of his age. There is a picture hung up in the hall at Chatelherault (not far from Hamilton), a hunting-seat of the Dukes of Hamilton, of Duke Douglas on this same horse, and on the back of the picture is written—

Douglas, 8th Duke of Hamilton. From Edinburgh to Hamilton Palace, in 2 hours and 25 minutes. (Signed) G. GERRARD, *Print.*

"As the Duke died in 1799, the ride must have taken place nearly a hundred years ago, so it is not possible that any man now living can tell of it except as a matter of tradition. After applying to several old men, the only one I came across who had any distinct recollection of hearing about the occurrence in his youth, was Mr James Holmes, a man of about fourscore, who long ago was a hunting man, in the days of Lord Kelburne in Lanarkshire, and who has a distinct recollection of being told by his father and mother of Duke Douglas having trotted from Edinburgh to Hamilton Palace in two hours and twenty minutes; how that his servant had galloped all the way to keep

¹ About thirty years ago Glasgow and its neighbourhood were famed for horses that went well, particularly from the hocks. A son of the above-named Douglas was then freely used by its owner, Mr John Hendry, and its fame was carried down many years. Another son of Douglas was used by the late Mr Lang on the hardy mares in the island of Mull. Mr Munro says that to this day cobs from the island are valued, and this owing chiefly, he believes, to the Douglas cross.

up with his master trotting, until the servant's horse dropped dead at the river Clyde, about a mile from the palace; how the servant walked home carrying his saddle, and met the Duke returning on foot from the stables: 'Where is your horse?' said the Duke. 'Dead, your Grace,' was the curt reply, and both walked on. Mr Holmes, who is one of the most respected tenants on the Hamilton estates, and whose statements may be implicitly relied on, says he can say nothing about this horse's pedigree, but that he always understood that the Norfolk horse Douglas, which belonged first to the late Duke, and is referred to in my letter to you published in vol. iii. of the Hackney Stud-Book, was of the same line as the horse ridden by Duke Douglas from Edinburgh to Hamilton, and that the horse in the picture at Chatelherault strongly resembles the horse Douglas, which he well remembers.

"You will observe that the painter gives the time at two hours twenty-five minutes, Mr Holmes at two hours twenty minutes, or five minutes less. The distance, measured on an old edition of Arrowsmith's Maps of Scotland, is fully thirty-six miles from the old cross of Edinburgh; or if the start was from Holyrood Palace, as tradition says, it will be thirty-seven miles—equal to over fourteen and a half miles per hour.

"I think this compares well with any performances on record."

MOTIVE POWERS OF THE FARM.

By W. J. MALDEN, Cardington, Beds.

WHEN Adam delved there is every reason to suppose he was the only motive power employed upon the farm; and although in the more civilised countries mechanical contrivances of great power, and capable of performing very varied operations, are commonly used, man is still the only motive power engaged over immense tracts in countries where little civilisation exists. Indeed, on very small holdings and allotments in civilised Britain he is often the only motive power to-day. The brain of man has enabled him to develop engines and machines capable of performing, with little manual exertion on his part, a vast number of operations necessary in manipulating the land and causing it to be productive; and these engines are made on such a large scale that one of them will do as much work in a given time as many men. Animals, water,

wind, gas, oil, and electricity have each been made to develop force, and have been controlled so as to transmit it to machines to perform the work of the farm; but the machines, with all their varied motions, though capable of performing a large amount of work in a given time, after all cannot transmit a motion which man cannot perform. Man can haul or lift by his arms when stationary, or by his body in motion; he can impart a rotary, oscillating, vertical, or horizontal motion by his arms; and can pedal to produce motion by his feet, and transport on his back. He is therefore a complete machine, his brain supplying the motive power. Such a complete machine, however, would not rest satisfied while other powers were to be subjugated, and one by one the forces already mentioned have been shaped to do the work which he formerly had to perform.

There never was a time when "every rood of land maintained its man." The produce from a rood would never have produced sufficient food to grow men big enough or strong enough to have made this nation what it is. In these days, when small holdings are being so persistently urged, it is well to remember that the prosperity of nations and their position among the nations of the world have been very much commensurate with the size of the farms. Belgium with its small holdings intensely cultivated, and Ireland with its small holdings not intensely cultivated, do not greatly influence the councils of the nations. On small holdings, where the labour is mainly executed by that perfect machine, man, mechanical contrivances to minimise the cost of the work cannot be so profitably used as on large farms; and for that matter stock-keeping—and more important, the improvement of farm stock—cannot be carried out, as there is not sufficient scope for them. Civilisation calls for luxuries—in fact, what would be luxuries for barbarians become necessities to those who are civilised. A portion of the inhabitants have to engage in the production of these necessities, and this state of affairs draws from the land those who would otherwise have been engaged upon it. As they leave the land, mechanical means have to be devised to do their work, consequently attention has to be directed to the manufacture of labour-saving machines.

The perfection of the machinery of the farm has at all times borne a relation to the prosperity of the nation, even in long bygone ages. When other nations held ascendancy, and Britain was practically untilled, other countries were far in advance of it in mechanical aids. As our nation worked itself to the front, it gradually became farmed in larger holdings, and the machinery was correspondingly improved. At the present moment, through so much of the world having been brought under civilisation, and the ready means by which these mechanical aids to farming can be transported, cultivators at home and abroad are suffering

from the effect of over-production—our country does not hold a special advantage over others in the matter of means for the cultivation of the land. How important agricultural machinery is to agriculture and to the nation at large may therefore be readily understood.

In considering the motive powers of the farm from the farmer's rather than from the engineer's aspect, it is not necessary to deal further with man as a motive power, perfect as he may be to perform the many operations so far as his limited strength permits. In future he must be regarded as the overseer and director of the other forces brought under his control.

The sources from which energy is obtained have been mentioned. Some of these combined become more effectively useful; but in the first place it is advisable to see to what use they may be primarily put, so as to be advantageously used in British agriculture.

Animal power, chiefly from horses, to a less degree from cattle, for direct draught, as in hauling; for application to machines to turn a capstan giving motion to a wheel or windlass; and for pedalling to turn a tread-mill.

Wind to turn a windmill, whether with vertical or horizontal sails.

Water to actuate a wheel, whether breast, overshot, or undershot; a turbine; and hydraulic ram.

Steam to give a rotary motion to be transmitted by cogs, endless bands, &c., to other machines; for hauling by a windlass; for traction; or for working a steam-turbine.

Gas and oil by explosions to perform the operations effected by steam; except, owing to want of a sufficient accumulation of the gases when exploded, to work a turbine.

Electricity, for performing operations similarly to gas and oil engines.

That powerful animals, like the horse and the ox, which are easily domesticated, should be used for purposes of draught and transport is only natural, and until comparatively recent years they were the only motive powers called to the aid of man in the tillage of the land. To make them valuable it was important that suitable implements and machines should be made for them to work. Until the population increased sufficiently to demand the assistance of other means of tilling than man with his spade effected, the horse was little used on the land. The introduction to farm-work of the horse and ox necessitated the employment of implements to plough, and subsequently to stir the land; and for a long time this was their only employment on the farm, except for hauling or carrying. It was not until the necessity for machinery to perform other operations on the farm than tilling the land was felt, that the horse was applied to work stationary

machines. This of course opened a wide scope for the engineer, as is shown by the number of machines in use on the farm at present. The use of the horse for purposes other than for direct haulage was dependent on the introduction of machines which were worked by a rotary motion.

The manner in which the horse does its work may be divided into three classes—(1) The horse-gin, that in which the horse is yoked to an arm attached to a revolving capstan, around which it walks in the same track; to the capstan is attached a large cog-wheel which turns a smaller pinion-wheel, thus imparting motion to the machinery. (2) A self-contained machine drawn by the horse, motion of the parts being derived from the travelling wheels. (3) A tread-wheel, where the horse sets in motion a wheel by means of the weight applied to a revolving platform which recedes as fast as the horse advances, somewhat on the principle of the endless staircases provided for unwilling residents in her Majesty's prisons—practically the only instance where the horse does not perform its work by draught.

Whilst the manufacture of farm machinery was in the hands of the village blacksmith and carpenter, it was impossible that improvements and discoveries would be made rapidly, and it was not until the formation of large firms which could afford to pay for the services of competent engineers acquainted with exact laws of mechanics and physics, that great strides were made. The inventions introduced for horse-power machinery proved valuable for application to other motive powers as they were discovered and applied, and rendered them more rapidly valuable than they would have been had the principles not been put to the test previously.

The value of the horse as a motive power on the farm is still great, in spite of the many valuable mechanical motors brought into use in recent years. In the present condition of affairs it is impossible to entirely discard the horse, though it can be substituted in many operations. On more than one occasion it has been stated that it is doomed to go, but it is still necessary, and is likely to be. A portion of the work at one time done by horses has been taken over by mechanical aids, and it is for the farmer to see if he can further economically substitute machinery for them. The horse is part of the farm produce, and his breeding and "making" may be the source of profit beyond that which is obtained from his labour, as after a few years' work he may still be at his full value for sale; not so, however, with the machine, which is bought at full cost, and having done a week's work becomes a second-hand machine.

Had steam cultivation been shown to be superior to horse-work there need have been little for the horse to do; but though valuable in many instances for particular purposes, it has proved itself inferior in the majority of cases: and it is only

an auxiliary to horse-work. Even in the small operations on the farm, such as root-pulping, pumping, &c., which are economically done by other motive powers, the job-horse employed for incidental work is as efficient, and in times when an extra horse is of special value on the land, at such seasons as seeding or harvest, his work is of sufficient value to pay for his keep in

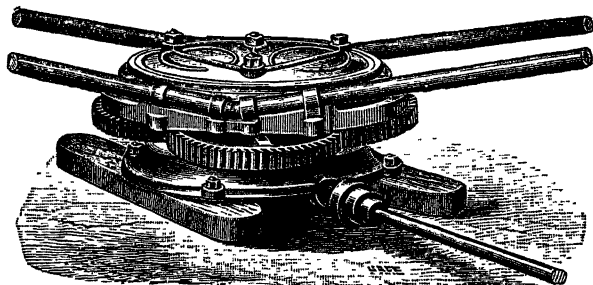


Fig. 18.—*Triplex Horse-Gear—in working order.*

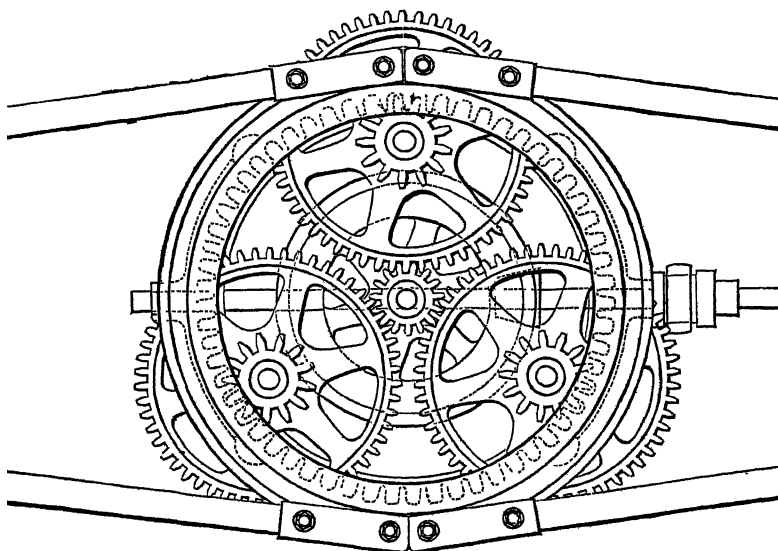


Fig. 19.—*Triplex Horse-Gear—uncased.*

slacker times. The horse must therefore be kept on the farm, in spite of modern mechanical introductions.

There are many different methods of gearing to obtain increased speed for working high-speed machines like milk-separators, but nothing surpasses Messrs Lister's triplex horse-gear (figs. 18 and 19), which requires no intermediate gearing. The

lay-shaft makes 64 revolutions to one of the horse, so that by attaching a 24-inch pulley at the end of this shaft it is possible to drive a cream-separator without the intervention of a separate gearing.

The work effected by a horse in a minute, or other specified time, is the basis on which the power of mechanical motors is estimated. Experimentally it was found by Watt that a horse exerted energy which would raise 550 lb. to the height of 1 foot per second; therefore 33,000 lb. per minute, and 1,980,000 per hour. These are recognised units per second in this country, and are called foot-pounds. It is found, however, that a horse will not sustain this work, and it is spoken of as actual or real horse-power to distinguish it from nominal horse-power. The average power of a draught-horse is accepted as being 0·785 of the conventional value mentioned.

The nominal horse-power is a conventional term for describing the dimensions of a steam-engine, for the convenience of sellers and purchasers of engines, and bears no fixed relation to indicated or effective horse-power. The unit of 33,000 foot-pounds per minute is the usual basis for calculations of the power of motors of all descriptions. The power of a machine is the energy exerted; and the effect is the useful work performed in some interval of time of definite length, such as second, hour, &c. This is less than the power to the extent of the loss of energy exerted in overcoming the resistance in the machine itself, such as friction and working its own mechanism.

Wind-engines are of great antiquity, and considering the large amount of wind force at almost all times and in almost all places available, it is astonishing that far greater use has not been made of it. With improvements in construction they are being largely used, and increasingly so. The great work they performed in the drainage of the Fens of England and the lowlands of Holland in comparatively modern times, rendering immense tracts of land valuable, testify to their value in the simple form in which they were erected then. Some of those remaining are of exceedingly simple construction.

The advantage of wind-power is that it costs absolutely nothing to generate, sustain, or control: the whole expense is incurred in the erection of the engine. As a rule, in the use of water-power it is necessary to incur considerable expense in making embankments, sluices, reservoirs, or other expensive works to control and collect the water so as to be able to use it to advantage. This is avoided in the use of wind; but wind-power suffers from the fact that it is subject to great variation in force—at times being greater than is required (although this objection is minimised by means of self-regulators), and at others

being insufficient to execute any work whatever. Where constant and regular power is necessary it cannot be relied upon.

Wind is far too valuable a force, however, to be allowed to go altogether to waste, particularly in those situations where other power is not easy to obtain. There is scarcely a homestead of ordinary size where the cost of erecting a windmill will not be defrayed within a short time. With little expense in labour, and none in generating power, a wind-engine costing, to erect and put into good working condition, £30 to £40, will pump the water, pulp the roots, and kebbles the corn for the whole of the live stock on a large farm. Plenty of instances can be adduced where this is done. It will work day and night, and all the attention required is to keep it occasionally oiled, and switched from one machine to another as desired.

The intermittent nature of the power obtained from wind points to the advisability of using wind-engines of moderate size and expense rather than very large ones, such as are employed for various kinds of factories and mills. The farmer would not be likely to be able to keep a large one in employment at all times, and it is best regarded as a means of accomplishing the minor operations of the farm. Where it is required merely to pump water for outlying stock, a very small engine is sufficient.

The windmills in use are of three classes—(1) the old form, including the post-mill and the tower or smock mill, where the sails or vanes are separate, and work almost vertically, with slight horizontal allowance known as the angle of weather; (2) the circular wheel, having a vertical motion; (3) the horizontal wind-engines, in which the sails have a horizontal motion.

The post-mill and the smock-mill are so well known that a detailed description is not necessary. The effective power of a windmill with sails of the best form, and about 15½ feet radius, with a breeze of 13 feet per second, is about one horse-power. The velocity and force of the wind is shown in the following table:—

| Miles per hour. | Feet per second. | Force in lb. per sq. ft. | Description. |
|-----------------|------------------|-----------------------------|---|
| 1 | 1·47 | ·005 | Hardly perceptible. |
| 5 | 7·33 | 0·123 | Gentle breeze. |
| 10 | 14·67 | 0·492 | Pleasant breeze. |
| 15 | 22·0 | 1·107 | |
| 20 | 29·3 | 1·968 | Brisk gale. |
| 40 | 58·6 | 7·872 | Very high wind. |
| 50 | 73·3 | 12·300 | Storm. |
| 100 | 146·6 | 49·200 | { Hurricane carrying away buildings. |

It was usual to cover the sails with a cloth, unfurling as much as was required according to the force of the wind, but they are

made now in all types of mill so as to be self-adjusting, in order that the effort of the wind on the sails may be maintained nearly constant through all variations of velocity.

Windmills with a large number of sails radiating so as to form a disc-wheel have come into very general use of late. The illustration of the "Gem" steel wind-engine (fig. 20) shows very plainly the principles adopted in its construction. The wheel is placed vertically, and the sails are slightly dished so as to afford greater resistance to the wind, and at the same time to offer less resistance during that portion of the revolution when they are not engaged. The adoption of steel in their manufacture is a great gain over the heavy wooden sails, as they can be erected on slight steel towers, the necessity for a substantial erection capable of supporting a heavy smock being avoided. This renders them more valuable for the many purposes to which the farmer requires to put them; albeit, the larger wheels are quite capable of doing heavy work which, as a rule, we think it advisable to effect with motive powers generated by more constant forces than wind.

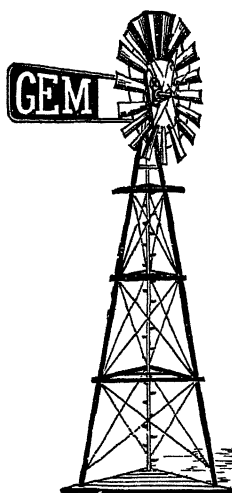


Fig. 20 — "Gem"
Windmill.

The horizontal wind-motor is a more recently introduced form of wind-engine. An illustration of Rollason's wind-motor (fig. 21) gives a good idea of its form. Each sail presents a solid surface to the wind, and, being concave, forms a box to hold the wind; the deflectors lying at an angle cause the wind on the sails to push with force to the peripheries, thus giving increased force. Five sails are provided, three of which are always in the wind. The open space between the sails and the shaft permits the wind to actuate the distant sail. The convex side of the sails is protected from the wind by the screen, which is actuated and kept in the proper position by the rudder. Half the motor is protected from the wind although the screen is only one-third the size of the circumference. Although the screen offers resistance to the wind, the fact that the sails revolve horizontally, ensures the safety of the engine, because, as in the case of the common spinning-top, the faster it rotates the greater is the tendency to the perpendicular.

A motor 8 feet in diameter, and sails 5 feet in height, will raise with wind at 16 miles an hour 125 gallons of water 80 feet through a 2-inch single pump. The illustration shows a 20-foot motor working a complete plant of fifty 16-candle power incandescent lamps, which has been running two years. Its power

can therefore be fairly well gauged; and its serviceability for producing motive power, such as could be advantageously utilised on the farm, may be estimated.

Messrs Rollason calculate that with a wind of 16 miles per

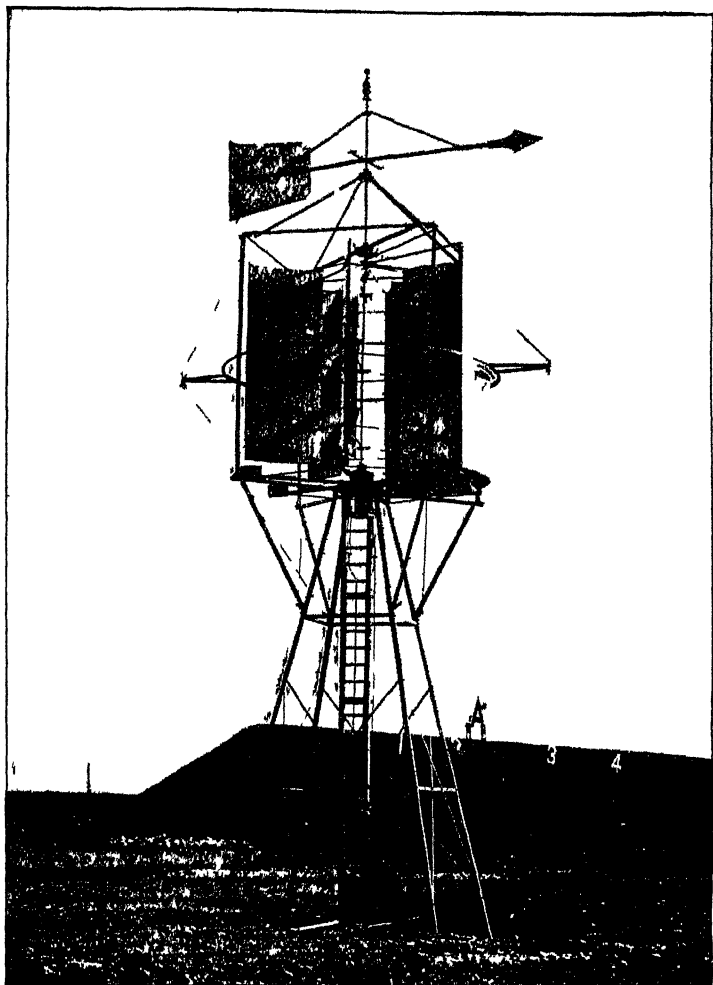


Fig 21.—Rollason's Horizontal Wind Motor.

hour, an 8-feet motor is equal to $\frac{1}{4}$ horse-power; 10-feet to 1 horse-power; 15-feet to $2\frac{1}{4}$, and 20-feet to 5 horse-power.

Water-power for effecting work on the farm may be employed through a great number of kinds of motors. The vast number of instances where water-power might be profitably employed,

but is allowed to waste its energy, while other motive powers have to be imported at considerable cost, occasions a loss which can scarcely be estimated. Every constant stream is of value; and even those which are intermittent in their flow have value during the time of their activity. Many streams which do not flow in summer with sufficient force to actuate a wheel which could do profitable work, will do very effective work in winter, the season when the farmer most requires its aid; and of course if a reservoir is formed the supply can be rendered valuable for a lengthened period. In many instances considerable outlay has to be made in erecting dams, sluices, reservoirs, &c., but when these are formed the motive power becomes controlled, the cost of maintaining them is little, and the power in the future is obtained free of expense. Notwithstanding the initial costs and expenses of maintenance, water must be regarded as one of the most valuable forces the farmer has at his command. Like wind-power, there is no loss of time in starting machinery as in getting up steam, and no carting coal, water, or other fuel; all that is necessary is to let the water flow, and the machinery is set in motion.

Before treating with the several kinds of water-motors, the power of a given supply should be explained. To ascertain with sufficient accuracy for the farmer's purpose what the volume of a running stream is, choose a portion of the stream where the section is fairly regular; mark off a convenient space—say 20 yards—along the bank; throw in a float, and see how long it takes to travel the distance set out; repeat this sufficient times to ensure accuracy. The speed thus measured is that of the surface near the centre of the stream. Near the bottom and the sides it moves more slowly—the difference depends upon the nature of the channel. A wooden trough with smooth sides and bottom should have 15 per cent taken off; a brick channel 17 per cent; sides and bottom of earth 29 per cent; and a rough mountain stream 36 per cent. The average section of the stream must be ascertained, and the area calculated by reducing the speed in accordance with the above conditions, and multiplying this by the area in feet, the answer is the cubic feet per minute.

Another mode of ascertaining the quantity of water is from the overflow on the weir; or, where no weir exists, planks may be placed across the stream and a rectangular notch made sufficiently wide and deep to allow the whole of the water to pass through. The water should be dammed back until it is as nearly as possible in the condition of a still reservoir, having little or no sensible velocity of motion until it approaches the overflow. Then if the width of the overflow and its exact depth are stated, the quantity of water can be calculated. It is important to notice that the depth of the overflow is not to be

taken at the edge (B, see fig 22), but at some point (E) back in the weir before the water begins to curve downwards. The depth to be stated is from C to D. After ascertaining this

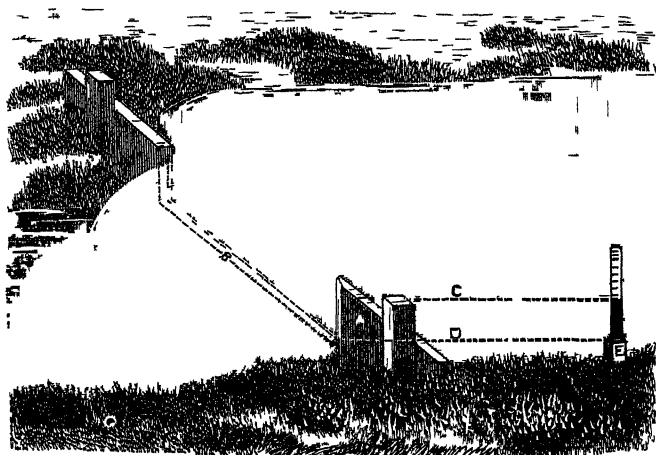


Fig 22.—Method of measuring Weirs.

depth, the following table should be made use of to show the discharge from each foot of width of sill in cubic feet per minute —

| Depth of c to d in illustra- tion in inches | Fractions of an inch | | | | Depth of c to d in illustra- tion in inches | Fractions of an inch | | | |
|---|----------------------|---------------|---------------|---------------|---|----------------------|---------------|---------------|---------------|
| | 0 | $\frac{1}{4}$ | $\frac{1}{2}$ | $\frac{3}{4}$ | | 0 | $\frac{1}{4}$ | $\frac{1}{2}$ | $\frac{3}{4}$ |
| 0 | 0 | 596 | 1 69 | 3 1 | 10 | 151 | 156 | 162 | 168 |
| 1 | 4 78 | 7 46 | 9 83 | 11 1 | 11 | 174 | 180 | 186 | 192 |
| 2 | 13 5 | 16 1 | 18 9 | 21 7 | 12 | 198 | 204 | 210 | 217 |
| 3 | 24 8 | 28 0 | 31 2 | 34 6 | 13 | 224 | 230 | 236 | 243 |
| 4 | 38 2 | 41 7 | 44 5 | 48 9 | 14 | 250 | 256 | 263 | 270 |
| 5 | 53 4 | 57 4 | 61 4 | 65 4 | 15 | 277 | 284 | 291 | 298 |
| 6 | 69 4 | 74 1 | 78 8 | 83 6 | 16 | 305 | 312 | 319 | 326 |
| 7 | 88 4 | 93 3 | 98 2 | 103 | 17 | 334 | 341 | 348 | 356 |
| 8 | 108 | 113 | 118 | 123 | 18 | 364 | 371 | 379 | 387 |
| 9 | 129 | 134 | 139 | 145 | 19 | 395 | 403 | 411 | 419 |

When the quantity of water and the fall are ascertained, the theoretical horse-power can be calculated by the following formula: when

Q=quantity of water in cubic feet per minute;

H=head of water from tail-race in feet;

P=theoretical horse-power;

$$P = 0.01892 Q H = \frac{528.5 P}{H}$$

The effective horse-power of the various water-motors are commonly given as—

| | | | | | |
|----------------------------|---|---|---|---|------|
| Theoretical power | . | . | . | . | 1·00 |
| Undershot wheels, old type | . | . | . | . | ·35 |
| Low breast wheel | . | . | . | . | ·55 |
| Overshot wheel | . | . | . | . | ·68 |
| Turbine | . | . | . | . | ·70 |

The effective power is, however, very dependent on the efficiency and construction of the wheels. A well-constructed turbine may give over ·80, and a high breast wheel will approximate to an overshot wheel, and an undershot with Poncelet vanes gives considerably higher than one of the old type.

In ascertaining the quantity of water required to produce a given power under a given fall, or *vice versa*, the following rules will be found useful:—

The height of the fall in feet multiplied by the number of cubic feet of water per minute, divided by 706, will give actual brake-horse-power. The horse-power required multiplied by 706, and divided by the height of the fall in feet, will give the number of cubic feet of water required per minute.

When the available quantity of water and the requisite horse-power are determined, the horse-power multiplied by 706, and divided by the quantity of water in cubic feet per minute, will give the height of fall in feet that will be required to produce the horse-power. The above figures are calculated upon 75 per cent of efficiency.

The common vertical water-wheel is made in three forms—the overshot, breast, and undershot. In the case of the overshot wheel and the breast wheel, the water is supplied at or above the summit, and acts wholly or chiefly by its weight. In the undershot the water acts by impulse, though, if a low breast is applied from the sluice to the tail-race, it becomes a low breast wheel, in which the water acts partly by weight, though chiefly by impulse. The undershot wheel was greatly improved by Poncelet, who substituted curved floats with a concavity backwards in the place of the old form of flat vanes. The efficiency was increased, and they are suitable for low falls with large supplies of water.

Professor Rankine laid down the following precepts as being generally acceptable when considering the choice of wheel: “Taking the efficiency of that part of the fall which acts by weight on a weight-and-impulse wheel at 0·8, and of that part which acts by impulse at 0·4, and the efficiency of an impulse wheel at 0·6, it is evident that the weight-and-impulse wheel is less or more efficient than the impulse wheel, according as the portion of the fall of the former which acts by impulse is

more or less than one-half. In a weight-and-impulse wheel, also, the speed of the wheel should be about half of that of the water when supplied—that is, should be due to one quarter of that part of the fall which acts by impulse. Therefore the weight-and-impulse wheel is less or more efficient than the impulse wheel, according as the height due to the surface velocity of the wheel is more or less than one-eighth of the whole fall of the wheel. It is advisable that the surface velocity of a water-wheel should not be less than 6 feet per second. Eight times the height due to this velocity is about $4\frac{1}{2}$ feet; therefore for all falls not exceeding this the impulse wheel is certainly the best, and the greater the required surface velocity, the higher is the limit of fall up to which the impulse wheel is superior.”

With regard to the efficiency of the wheels: if the average efficiency of overshot and breast wheels, designed and constructed in the best manner, be estimated at 0.75, it follows that the energy of the available fall, from the penstock to the tail-race, to give one effective horse-power, is on an average $\frac{33,000}{0.75} = 44,000$ foot-pounds per minute. If, however, a wheel is drowned—that is, the tail is not sufficiently low to allow the water to run off freely—the efficiency is decreased to the extent of about one-fourth.

The overshot and breast wheels differ in general principles only that a portion of the breast wheel is encased in a breast of brickwork which by the formation of the buckets helps to retain the water in them until they reach the bottom. The efficiency differs little, as the water can be applied earlier to the overshot wheel. The diameter of an overshot wheel must be little less than the height of the fall of the water, and that of the breast wheel somewhat greater.

The *turbine* is a modern form of water-wheel which has rapidly come into common use, and is apparently destined to supersede the older forms of water-wheel. It is the most perfect utiliser of the energy supplied by a stream of water; will work efficiently in high or low falls; the wheel is of small dimension for the work it will execute; and it can be run at high speeds, rendering it more valuable for driving modern machinery.

The water is received and discharged in various directions round the circumference of the wheel. The wheel consists of a drum or annular passage containing a set of suitably formed vanes, which are curved backwards in such a manner that the water, after glancing off them, is left behind with as little energy as possible. The supply of water takes place either directly from a reservoir, in which case the wheel is placed close to a suitable opening at the bottom of the reservoir, or

through a supply-pipe and wheel-case. The former method is best suited to moderate falls, the latter to any high falls.

Turbines are commonly divided into three classes, according to the direction in which the water moves before reaching the guide-blades, and after leaving the wheel: (1) Parallel-flow turbines, in which the water is supplied and discharged in a current parallel to the axis; (2) outward-flow, in which the water is supplied and discharged in currents radiating from the axis; (3) inward-flow, in which the water is supplied and discharged in currents converging radially towards the axis.

The principle of the working of a turbine will be best realised from an illustration; and in the vortex-wheel invented by Professor Thomson, and manufactured by Messrs Gilkes of Kendal, a good idea of an inward-flow turbine may be gathered.

A movable wheel with a large number of vanes revolves upon a pivot. It is surrounded by a cast-iron case, from which it receives the water through four or more curved guide-passages. The water is admitted by one or more pipes to this case, and issuing through the guide-passages, acts against the vanes of the wheel, which is thus driven round at a velocity depending upon the height of the fall. The water having expended its force, passes out of the centre both above and below the case. In fig. 23 the cover is removed. Fig. 24 shows the case complete, as it is usually placed when at the bottom of the fall: A is the revolving wheel keyed on the shaft C, B one of the guide-blades, D the bell-cranks and shafts connecting the guide-blades with the outside bell-cranks and coupling-rods E, G the bracket and screw for raising the pivot (the pivot is not shown), H the wheel-cover, and I the supply-pipe by which the water enters the case.

It is impossible to fully describe all classes in a paper of this sort, or enter into the many details which require consideration when considering the relative merits between the various wheels. The advantages already mentioned are indisputable. A small quantity of water with a good fall becomes a considerable force when working a turbine, and many instances where water-power is allowed to pass by unutilised might be turned to profitable account.

Water-wheels are capable of executing any work performed by steam in driving machinery, and the supply of water alone controls the amount of work they can execute. The smaller operations of the farm, such as churning or pumping, may be done with small power; and the threshing, chaff-cutting, grinding, and similar operations, by greater power. With the low prices of farm produce, there is little margin to spare; and expenses of carting produce to a distant mill and fetching it back

as meal, the purchase and carriage of fuel for working other powers, are all matters of serious consideration.

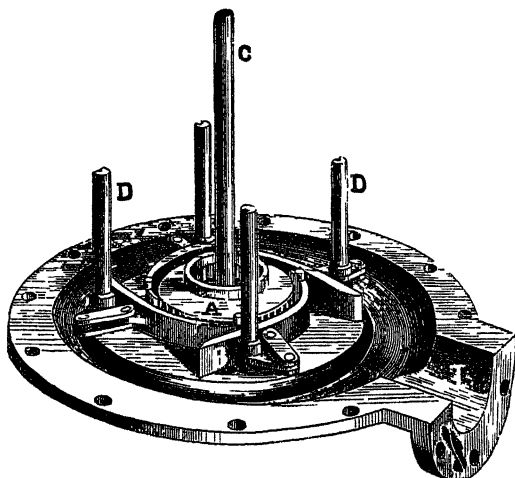


Fig. 23.—Turbine—cover removed.

The motive power derived from water costs little to maintain, and does not readily get out of repair, while no training is required to drive it, and there is no fear of bursting the boiler,

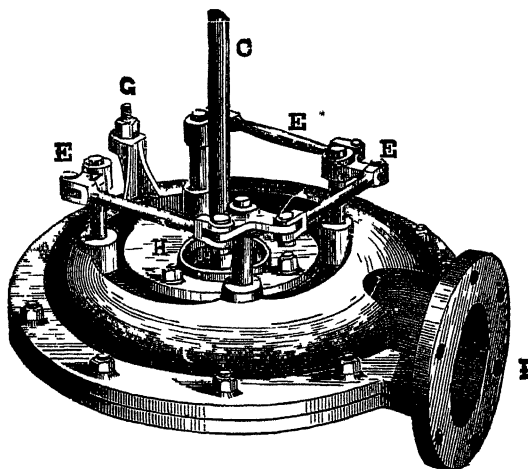


Fig. 24.—Turbine—case complete.

burning the fire-box, or priming the cylinder. Had homesteads been built more conveniently to the streams, water-power would

doubtless have been more freely utilised. However, machinery worked by rotary motion was little used on the farm until recent years; and in days gone by, no doubt it was not felt necessary to provide a motive power on the homestead, as there was little machinery to work, the corn going as grist to the local mill. The position of the homestead to streams was therefore little regarded. Steam-power which could be brought to the homestead was convenient when it assumed a portable form, and in its train followed the large army of rotating machines now considered necessary on a large farm. In the building of homesteads in the future the value of a stream should not be disregarded, more especially as it is impossible to tell how much electricity will influence the farmer of the future, far more so perhaps than is commonly recognised. Water-power may be used to generate electric force, which can be transmitted to considerable distances, and may displace no small portion of the steam-power on the farm before many years have passed.

The *hydraulic ram* cannot be passed by. A good water-supply is essential on the farm, and water can often be brought to the premises more cheaply by means of a ram than by any other process. The hydraulic ram was first constructed in a crude form by an Englishman, one Whitehurst of Derby, about 1772. He conceived the idea by noticing, what probably most readers have also observed, that when a tap at the end of a longish pipe is suddenly closed when running freely, a heavy jar is produced in the pipe. Whitehurst perceived that this property might be taken advantage of, because the result of the sudden arrest of water is that its pressure is momentarily increased enormously, and consequently if a small branch pipe be taken off near the tap a small quantity of water may be forced up it by the excessive pressure, at the moment of closing the tap, to a height far greater than that from which the water originally fell. Montgolfier, about 1820, devised a plan by which the motor was rendered automatic in its action. Mr Easton, the founder of the engineering firm, Messrs Easton, Anderson, & Goolden, saw the value of this new machine, and secured the rights under the English patent (fig. 25). From time to time it has been rendered more efficient by improvement in details; but the durability of the ram is shown by the fact that some of the original machines are still in operation and doing good service.

The great value of the ram is found when a running stream is near the site of premises at a higher elevation than the stream, and where an adequate water-supply cannot be obtained from other sources—not an infrequent case. When once the ram is fixed and the piping laid there are no expenses of

working. It works on year after year uninterruptedly. Where larger supplies are required, a water-wheel may be advantageously employed, provided the steam is sufficiently powerful (fig 26).

Steam-power, until the introduction of gas and oil engines, was the only portable power of which the farmer could avail

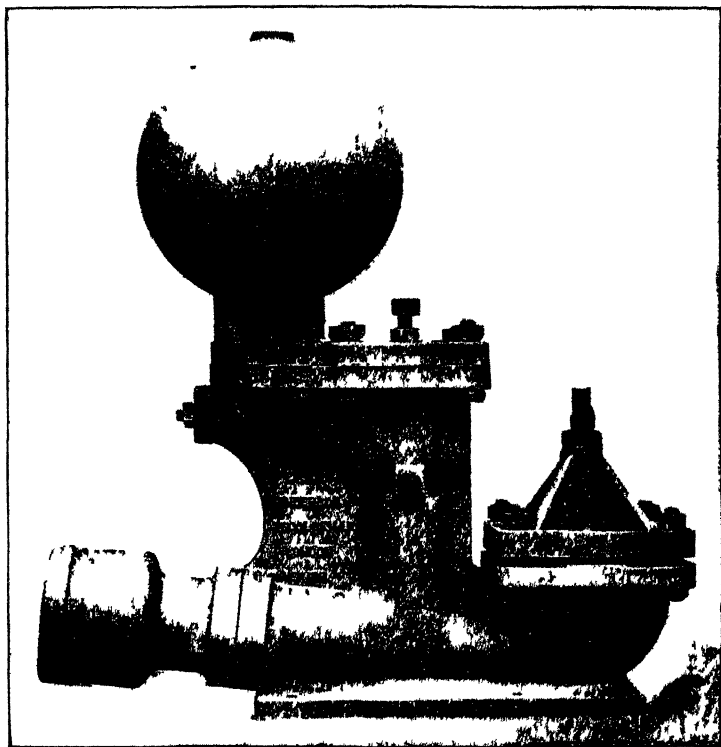


Fig 25.—*Easton, Anderson, & Goolden's Hydraulic Ram.*

himself; and it still remains the most important so far as the extent to which it is used indicates. The use of steam-power on the farm on a useful scale goes back to little more than half a century, although steam-power was used for pumping purposes, as in mines, considerably more than a century ago.

The popular idea is that Watt was responsible for the discovery of the power of steam, and of its adoption as a motive power. This is quite erroneous, for it was known centuries before his birth: he made improvements on the engines at work at his time, and also made numerous discoveries of great importance, which enabled him to produce an engine which was

the first representative of the steam-engine as it stands at the present time.

Hero, more than a century B.C., describes several engines in which steam was employed, though there is not much evidence of their having been largely used. In 1125 A.D. it is mentioned

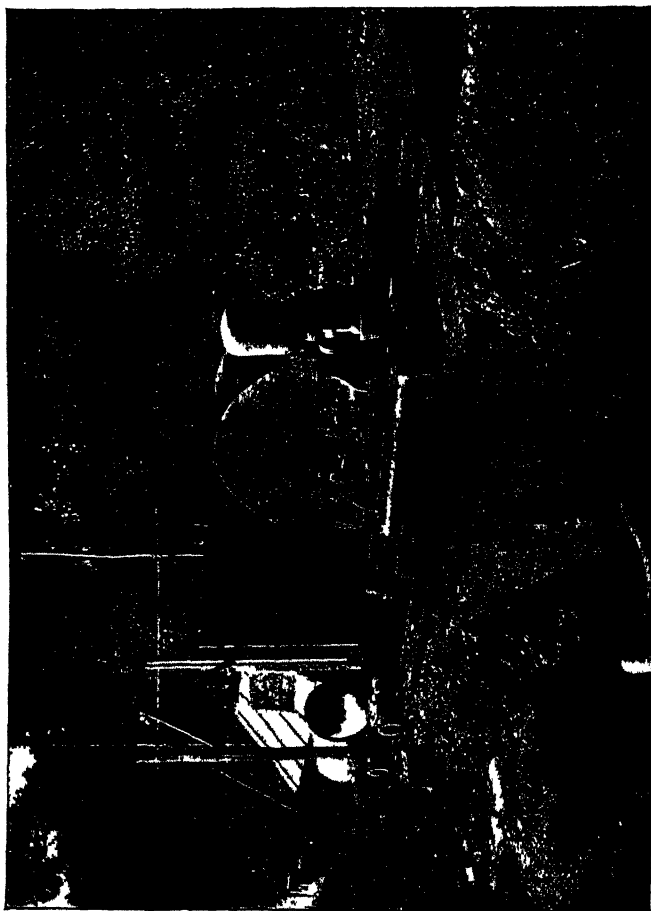


Fig. 26. — *Water-Wheel Pumping Works in course of erection by Messrs Easton, Anderson, & Co.*

that an organ was blown "by air escaping from a vessel in which it was compressed by heated water." Occasionally other mention is made of its use, but little progress is noted until the sixteenth century.

The seventeenth century was pregnant with discoveries, and in England the second Marquis of Worcester advanced the

use of it by utilising it for pumping. From that time it received regular and systematic attention, and was developed accordingly—Newcomen, Beighton, and Smeaton, and many others, making important improvements from time to time. They, however, relied on condensation, and used a piston acted upon on one side only. Watt made a long series of important discoveries, and he utilised them so that he invented engines which, with improvement in principle and construction, were of the type of our modern engines; this being possible by his use of the expansive property of steam, enabling him to make a non-condensing engine where the steam could be made to work on either side of the piston alternately. This was proposed by Watt in 1767, though he did not patent it until 1782. From that time he continually added improvements, and made fresh inventions of such valuable nature that the good effected was in no way lessened by the fact that he was not the maker of the first steam-engine.

It is impossible to follow here all the improvements and introductions which have been called in to make the farmer's engine what it now is; but by the adoption of sound principles of mechanics, and by working in accordance with physical laws, as great perfection is obtained in the construction of engines as can be economically realised from the data at their command.

Engines adapted to the use of the farmer are divisible into three classes—Portable, Stationary, and Traction. As a rule, multitubular boilers are used; though, very rarely, where large fixed boilers are used, Cornish boilers are employed. Within comparatively recent years the advantage of compound engines utilising the steam in the cylinder more than once by passing it through a second cylinder, has been demonstrated and carried into useful effect. The endeavour to bring them into general use on the farm has not been so successful as might have been anticipated, and this has resulted because of the more complicated nature of the parts, which involve greater skill in driving than the ordinary farm engine-driver possesses. The advantage of compound engines is otherwise undoubted, for the losses from the many causes affecting the heat-energy in the best simple engines is calculated as follows: 70 per cent of the total heat-energy derived from the fuel, including that which is lost in "steam-making," is rejected in the exhaust steam; 20 per cent is lost by radiation, conduction, and faults of mechanism; thus leaving only 10 per cent which is converted into mechanical effect.

In the trials conducted by the Royal Agricultural Society of England, the consumption of pounds of coal per horse-power in the two leading simple engines was 2·6 and 2·76, and of the compound engines 1·85 and 1·94 respectively—giving a percent-

age of advantage in favour of the compound system of 28·9 per cent and 29·7 per cent respectively; thus showing, in the most conclusive manner, that the heat-energy brought into useful effect was greatly in favour of the compound engines.

A lesson which might be learned from this is, that—having in view the fact that compound engines are not more generally used, due to the want of better knowledge on the part of the men in whose charge they would be placed—it is highly important that means for teaching farm engine-drivers should be devised; and such work comes well within the scope of technical instruction as intrusted to county councils, or failing this, agricultural societies. If it did nothing more, it would undoubtedly have the effect of greatly reducing the quantity of fuel used.

Stationary engines cannot be worked to the best advantage on the farm, as the work has to be brought to them, and it is often convenient to do the work at some distant part of the farm. Small stationary engines, however, are useful for dairy-work, and for performing small operations, such as pulping or grinding. Another useful account to which they may be put is to generate steam for steaming food. Even where there is a prejudice against steaming food under ordinary conditions, it may be used with great advantage in steaming mouldy foods, such as hay, which in a mouldy condition are unpalatable and poisonous, but when steamed are palatable and nutritious. For cleaning dairy utensils, for heating water and similar purposes, steam is of great value: these are advantages not shared by wind, water, gas, oil, or electricity.

The portable engine has been used most frequently on the farm, but traction engines have been gaining popularity of late, as considerable losses have been sustained through injury to horses in moving the heavy machines, and because of the loss of horses' time incurred in taking the machine from one farm to another where let on the hire system. Considering the greater expense of the traction engine, it is usually found advisable to use a portable engine where the engine requires little moving, as when kept on one farm, but where let on the hire to use the traction.

In outlying districts where there is a considerable amount of haulage to be done at long distances, a traction engine possesses additional advantages. The traction engine also has a special use for steam-cultivating, though the implements are generally of such great size that engines of larger power than is usually required for the other purposes of the farm are employed. There is a gain in using big engines and large implements in the saving of labour and fuel; but it is highly probable that steam-cultivation would have been more popular than it has

become had the machinery been made on a smaller scale, for it could have performed work without presenting many of the objections arising from the heavy tackle employed. Steam-cultivation has been very much sacrificed to the attempt to save a portion of the working expenses which could have been more than met by the better work done.

Steam has also been used to drive a steam-turbine, and Messrs Lister have a very ingenious plant for dairy purposes (fig. 27).

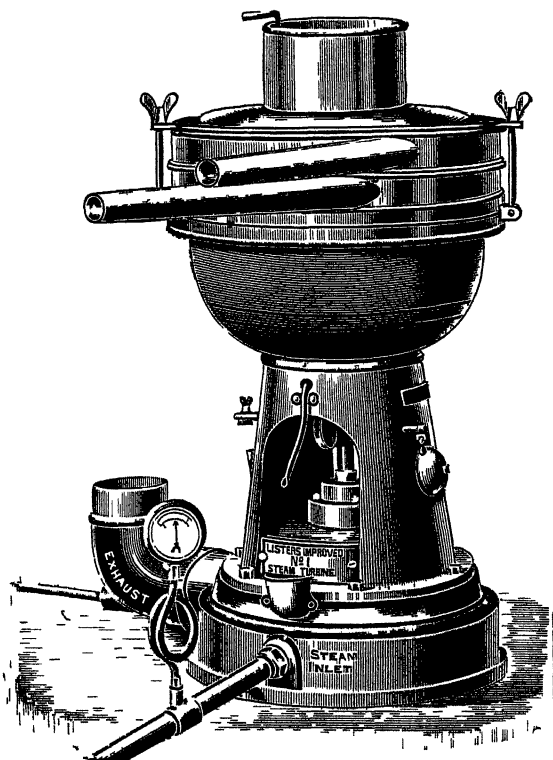


Fig. 27.—*Lister's Separator, worked by steam-turbine.*

The plant consists of a rapid-heating boiler which generates steam; the steam is conveyed to the turbine by a pipe, and the separator is set in motion without the intervention of straps or bands, all shafting being dispensed with. The steam can be diverted to any other purpose desired in the dairy, pumping, or for steaming food. The avoidance of expense of fixing shafting, the little skill required in its management, and the rapidity with which steam can be got up, are all in its favour. In a test

made with coal of poor quality from the Forest of Dean, costing 7s. per ton, 150 gallons of milk were separated in two hours with a consumption of 28 lb. of coal,—practically $\frac{1}{2}$ d. per hour.

Gas and oil engines—as those in which *gas* and *oil* are used as sources of motive power are called—have been developed and rendered serviceable for agricultural purposes. The useful adoption of these engines has taken place quite recently, but the principle by which the motive power is obtained is centuries old, having been discovered by Hautefeuille in 1678; and Huyghens in 1680 constructed a machine consisting of a cylinder containing a piston which was made to rise by gases generated by the explosion of gunpowder. When the gases cooled the piston fell by atmospheric pressure, carrying with it a weight suspended over a pulley. A very notable feature in Huyghen's machine was that it was the first in which the cylinder and piston, now so generally applied to steam and other engines, was used. His machine was therefore the prototype of modern engines in two highly important features.

Gas and oil engines may be considered together, as the principle by which the motive power is obtained is very similar. In each gases are generated by explosion, and these gases under ordinary atmospheric pressure occupy a much greater space than the substance before explosion. By controlling these gases within the cylinder of an engine, thus preventing their expansion, they exercise pressure on all parts of it, so that a piston inserted in it may be moved from end to end, thus setting the machine in motion in the same manner that steam actuates the piston of a steam-engine. The familiar gas explosion which occurs in dwelling-houses and other places on the ignition of gas which has escaped and become mixed with air in confined positions, illustrates roughly what the force is. In the gas-engine ordinary coal-gas is used where it is obtainable; while, where this is not convenient, it is necessary to manufacture an explosive gas, the most economical being that made by the Dowson plant, where a mixture of steam and air is passed through incandescent fuel, such as anthracite, coke, &c. (fig. 28). In the oil-engine an explosive oil, such as petroleum, is used.

The oil-engine is now regarded as the more convenient for farm purposes in the larger number of instances, as, except where coal is very near, the cost of carting coal and the expense of making gas tell heavily against the comparatively small cost of carriage of oil. The small space required for storing the oil compares favourably with that necessary for storing fuel and fixing plant for gas generation. The oil and gas engines require little skill in management, can be set to work in far shorter time than is needed to get up steam, and have

fewer expensive parts, such as the boiler and fire-box, to get out of order than has the steam-engine. The quantity of water required in the working of steam-engines is obviously greater, as all that is required for the gas and oil engines is sufficient to cool the cylinders, while some avoid the necessity of water by cold blasts—a matter of importance on outlying hill or down farms especially.

Gas and oil engines are particularly valuable where the work is of an intermittent nature, such as would require steam to be

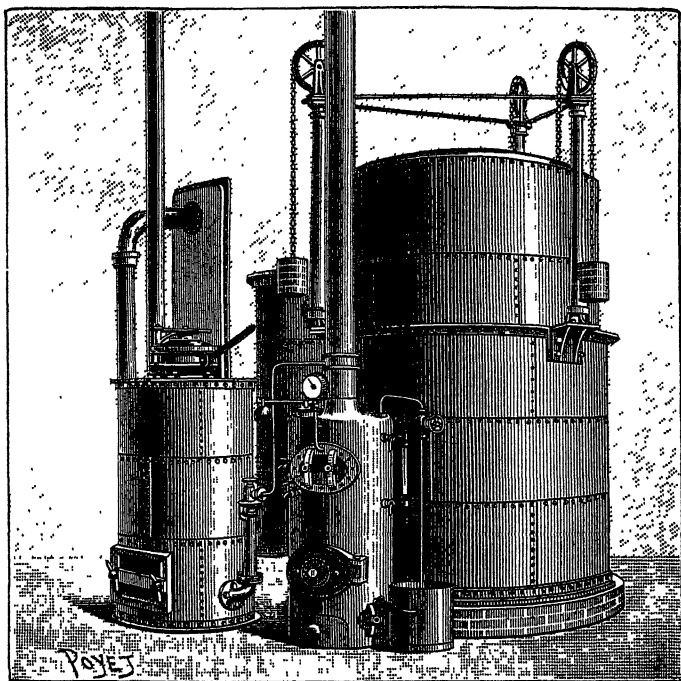


Fig. 28.—*The Dowson Gas Plant, for generating gas for Gas-Engines.*

got up several times a-day, or that the furnace should be kept going for long periods while the engine is at rest, or in such cases as dairy-work, where motive power is required for a short time only each day. They do not possess the value attaching to steam-engines of generating steam or heating water, which may be utilised in cleaning, heating, and other purposes in the dairy, or for cooking food for the animals.

Oil-engines are now made in a portable form, which greatly enhances their value for the general purposes of the farm. The series of trials carried out at the Royal English Show at Cam-

bridge brought forward a considerable number of portable engines suitable for farm-work, and fully demonstrated their value to the farmer. Although other engines did excellent work, the contest finally lay between the engines entered by Messrs Hornsby (fig. 29) and Messrs Crossley: the latter

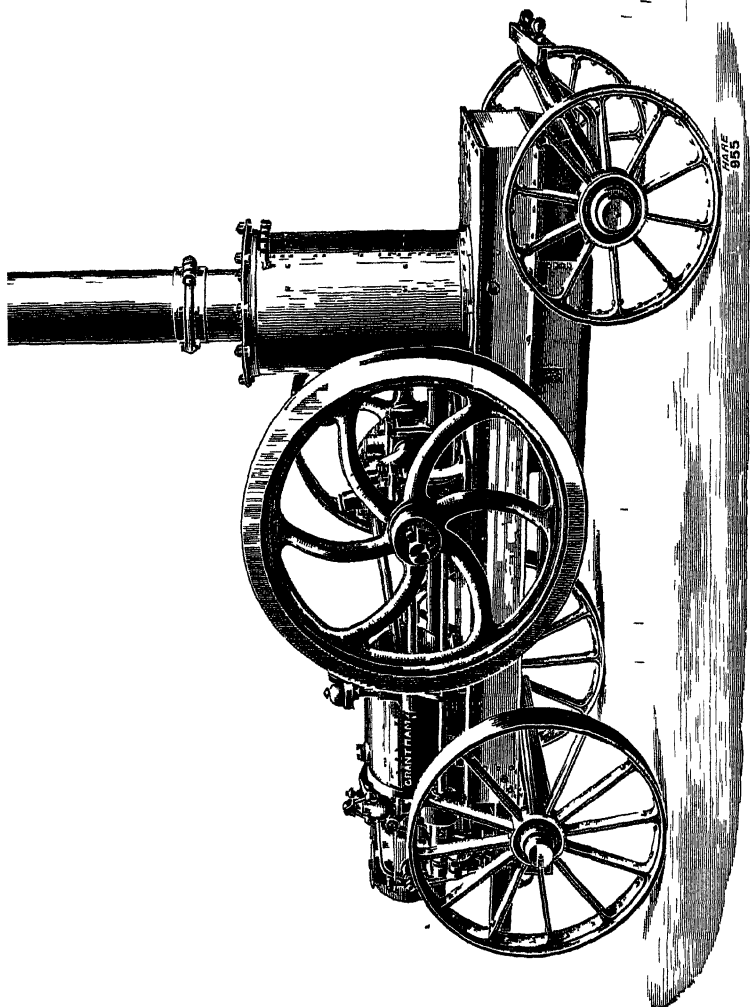


Fig. 29 — The Hornsby Akroyd Portable Oil Engine.

worked with slightly less consumption of oil, but other points led the judges to award the first position to Messrs Hornsby. The first illustration of Messrs Hornsby's engine (fig. 29) shows it in the portable form; but the outline view (fig. 31) of the sta-

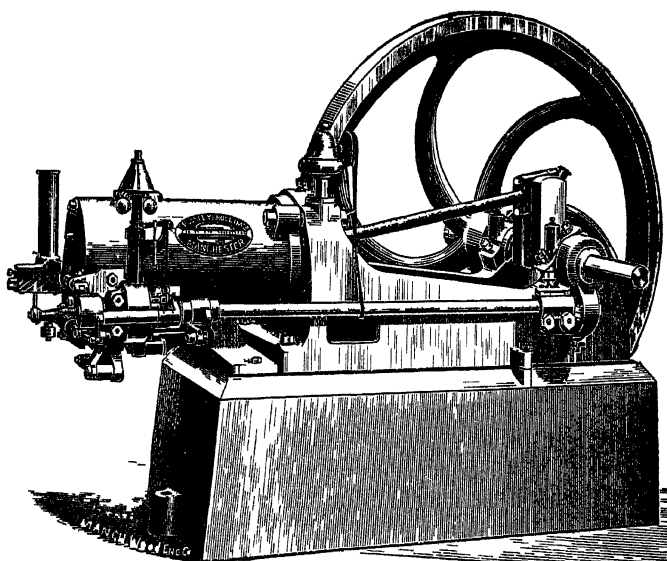


Fig. 30.—Missis Crossley's Gas-Engine

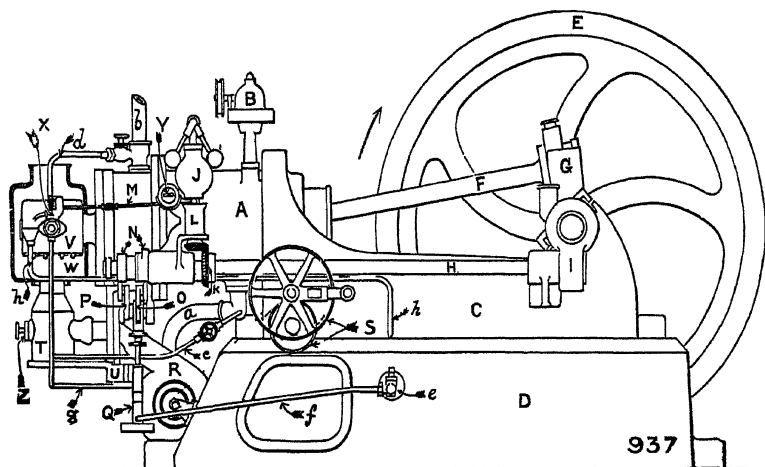


Fig. 31.—The Hornsby-Aldrich Oil-Engine, outline view.

- | | | | |
|-------------------------|--|--|--|
| A Cylinder | governor to vaporiser valve box. | w Vaporiser cover | d Water circulating outlet pipe from vaporiser valve box |
| B Cylinder lubricator | N Cams | x Vaporiser valve box | e Three way cock with filter inside |
| C Bedplate. | o Air inlet valve lever. | y Starting handle | f Oil supply pipe from tank to pump |
| D Base | p Exhaust valve lever | z Lighting hole plug | g Oil supply-pipe from pump to vaporiser valve-box |
| E Fly-wheel | q Pump | | h Overflow-pipe from vaporiser valve-box to tank. |
| F Connecting-rod | r Fan | a Water circulating inlet pipe to cylinder | |
| G Crank shaft | s Pulley and gear wheels for driving fan | b Water circulating outlet pipe from cylinder | |
| H Cam-shaft. | t Lamp | c Water circulating inlet pipe to vaporiser valve-box. | |
| I Shew gearing | u Lamp-pump and valve-lever bracket. | | |
| J Governor. | v Vaporiser. | | |
| K Governor gear-wheels. | | | |
| L Governor bracket | | | |
| M Connecting-rod from | | | |

tionary engine, with parts lettered, may probably render a better idea of its method of working.

Various methods of ignition, of the introduction of air, of supplying the oil to the vaporiser, of cooling the cylinder, of the relative position of the vaporiser to the cylinder, and of other details in construction, are adopted by the several makers; but a brief description of Messrs Hornsby's engine will be sufficient to illustrate the general principles of the working of these engines.

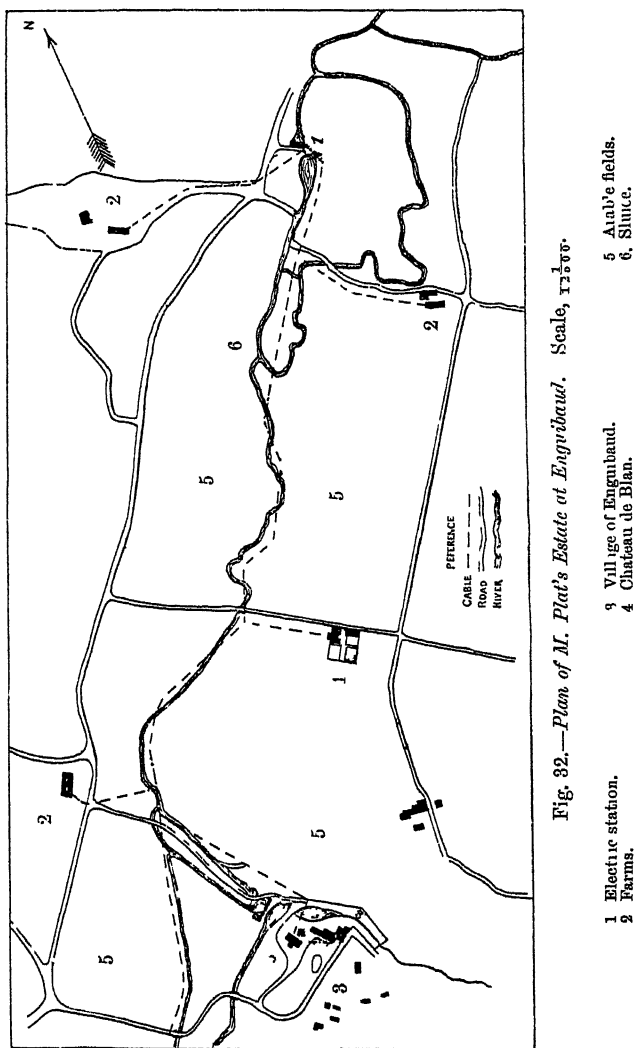
The vaporiser forms a prolongation of the cylinder of Δ shape, and is enclosed in a movable iron casing. (In engines of other makers a separate vaporising chamber is employed.) The oil is injected into this chamber with a little air at the commencement of each stroke by an ordinary plunger-pump, having suction and delivery valves in duplicate for security against sticking. In some engines an ignition-tube or lamp is required, but in this the explosion of the last stroke and the heat of exhaust gases keep the vaporiser at the requisite temperature.

At starting the vaporiser is heated by an external duplicate cast-iron lamp, with hand-blast, taking on an average about nine minutes before it is sufficiently hot to start the engine. This involves the use of oil, which has to be considered where work is of an intermittent nature; however, the time taken to start this engine was less than that of any other in the trials at Cambridge. The governor acts upon the oil supply, intercepting some of it through a by-pass when the speed is too high, and returning it to the tank. The oil-tank is in the bed-plate of the engine. The air and exhaust valves are driven by cams on a lay shaft; and a water-jacketed back-pressure valve is provided between the valve-chamber and the vaporiser to prevent the possibility of pre-ignition at explosion. The amount of compression can be altered for oils of different specific gravity by inserting packing-pieces in the connecting-rod end.

In the Cambridge trials the oil consumption, reckoned on the average of the three days' run, was 0.919 lb. per brake-horsepower per hour. This is equivalent to 1.18 lb. per coal, and would, at the price of the oil—Russolene with a specific gravity at 60° F. = 0.8239, and a flash-point of 86° F., costing in Cambridge 3½d. per gallon—cost 0.42d. per brake or effective horsepower per hour. In comparison with the coal used in the trial of compound engines at Newcastle, already mentioned, it is seen that the oil-engine used the equivalent of 1.18 lb. of coal, as against 1.89 lb. of coal used by the first-prize engine. The heat value of the oil used was 18,600 British thermal units per lb. Comparing this with Welsh steam-coal, with a calorific value of 14,500 thermal units per lb., 1 lb. of the oil-mill, in heating value, would be equivalent to 1.28 lb. of coal, and with London

gas, having a calorific value of 19·200 B. thermal units per lb., it would be equivalent to 0·97 lb. of gas.

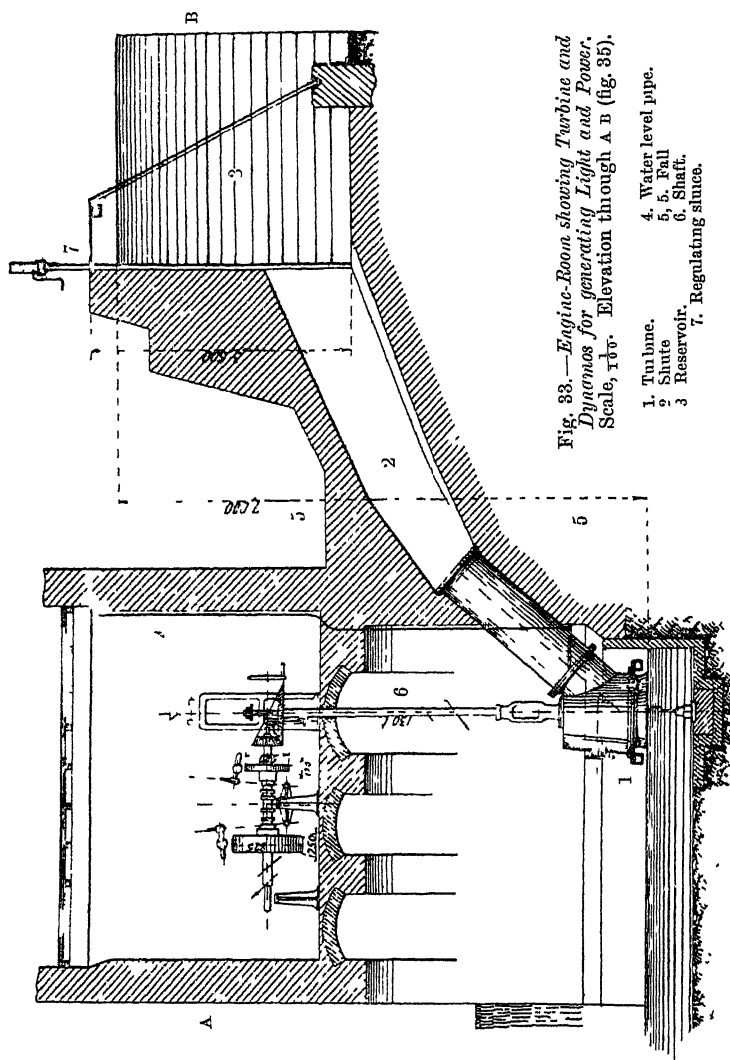
The practical value of oil-engines is thus established, and it is proved that they have reached a high state of perfection in



construction. That they will be used more frequently on the farm in future can scarcely be doubted.

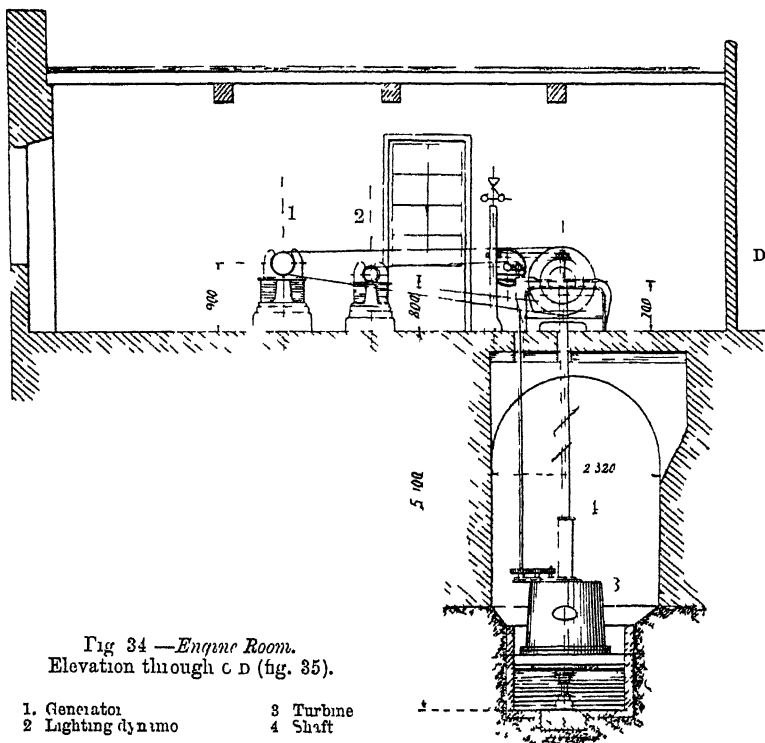
It can scarcely be expected that *electric motors* will have to be disregarded on the farm in the future. At present electricity

as a motive power is little used, but every day strides are being made which will result in its more general adoption. The possibility of its application to the purposes of the farm have been demonstrated in several instances; but the fact that M.



Plat, a French landowner of Enguiband in the province of Tarn, has established it on a practical basis on his estate, suggests that the day of its more general adoption is not far distant.

M. Plat makes use of water-power to work a turbine which generates electricity from dynamos attached to it, and also obtains power for electric lighting. With the force thus obtained he performs such operations as ploughing and other tillage operations, threshes the corn grown, grinds it, and conveys the produce from one part of the farm to another,—practically performing all the operations on the farm by its aid. By means of cables the motive power is conducted to any part



of the farm, rendering the hauling of heavy engines unnecessary.

The plans given below illustrate the methods adopted by M. Plat to transmit natural water-power by means of electricity generated thereby. Fig. 32 gives a plan of his estate at Enguibaud, at the northern side of which is the electric station. A stream bisects it fairly evenly. Along this stream is a row of poplars which have been pollarded to the height of about 20 feet, and on these the electric cable is carried; but branch cables are taken from this to supply power at several homesteads, any of

which may be tapped to supply motive power at any point. The cable is in positions which allow of its use for the purposes of tillage. In fig. 33 the method of supplying water to the turbine, and of communicating the power to the dynamo, is plainly indicated. Another view of this is given, fig. 34. In fig. 35 the position of the machinery in the engine-room is shown.

The power is conveyed by overhead wires to different points as required. The manner in which the power is conveyed from the overhead wires to actuate the winding gear, where ploughing or other tillage operations are to be effected, is shown in

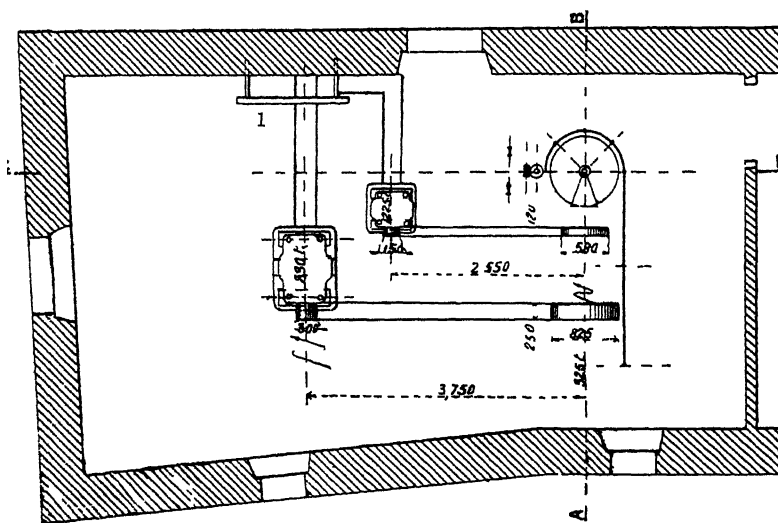


Fig 35.—*Plan of Engine-Room.* Scale, $\frac{1}{100}$.

1. Switch board.

fig. 36. The winding gear is carried on a waggon-anchor provided with two drums, one of which carries the hauling cable, and the other the return cable; but it will be shown that by change of gear each may be made a hauling or unwinding drum. By referring to figs. 37 and 38 it will be seen that there are two trains of wheels, either of which can be put into work by the clutch-gearing carried on the spindle in front of the cable-drums. This form of gearing is adopted to simplify the construction of the machinery, and so that the dynamo may be constantly running in one direction. Heavy work is put on the hauling parts only when the implement is being hauled towards the waggon-anchor; this avoids the necessity of a second waggon-anchor at the opposite end of the field, and also of the means for hauling it forward at each bout of the plough: the plough

thus runs back empty. A reference to fig. 36 shows the method of anchoring at the opposite end of the field—a cable runs from anchor 6 to anchor 6, on which is carried a running pulley 7 which adjusts itself to the position of the work. These

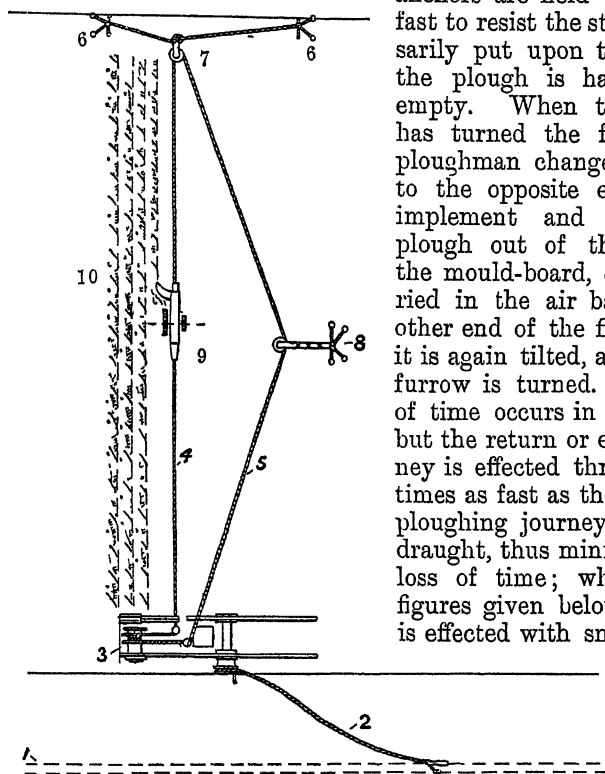


Fig. 36.—Plan showing the position of the Hauling-gear, Plough, and Overhead Electric Wires.

- | | |
|-----------------------------------|---|
| 1. Overhead electric wires. | 7. Self-adjusting pulley running on cable attached to 6, b. |
| 2. Dynamo lead. | b. Intermediate anchor. |
| 3. Winding-gear on waggon-anchor. | 9. The plough at work |
| 4. Hauling-cable. | 10. Ploughed land. |
| 5. Return-cable | |
| 6, 6. Anchors. | |

Note.—Figs. 36, 37, and 38 should be compared together, when the means by which the overhead cable is connected with the electric cable-drum on the waggon-anchor will be seen. The position of the winding-drums and the course of the hauling-cable are also plainly shown; as are also the means for putting the hauling-gear in and out of motion, so that each is made a hauling-in or paying-out cable.

energy. Whether further development will result in the double-anchor system being adopted (it was tried by M. Plat, and found under existing conditions to be inferior to the single-anchor system) remains to be proved. A waste of time and

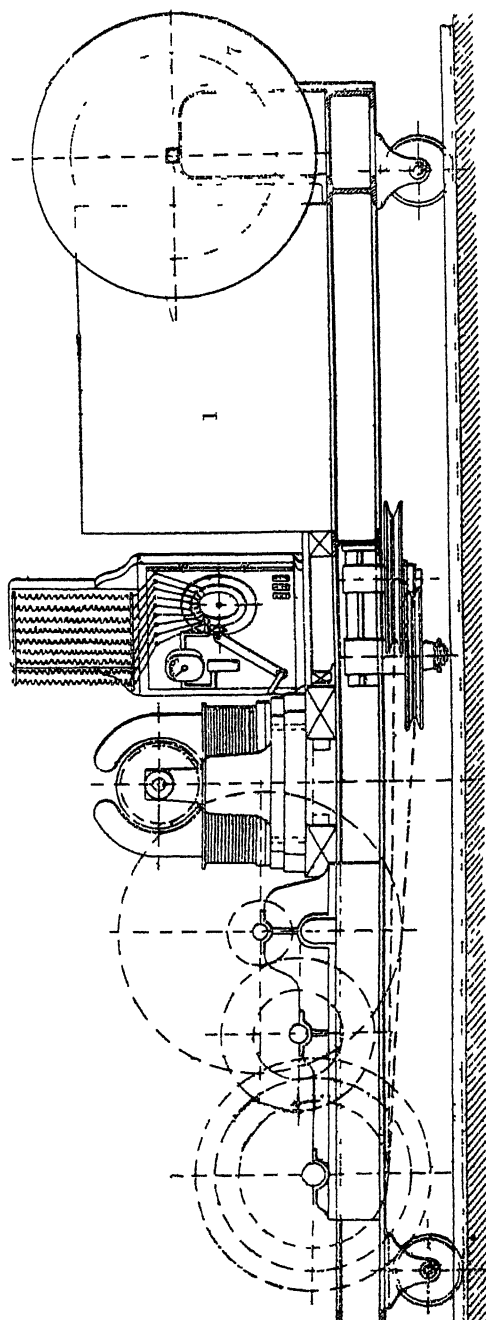
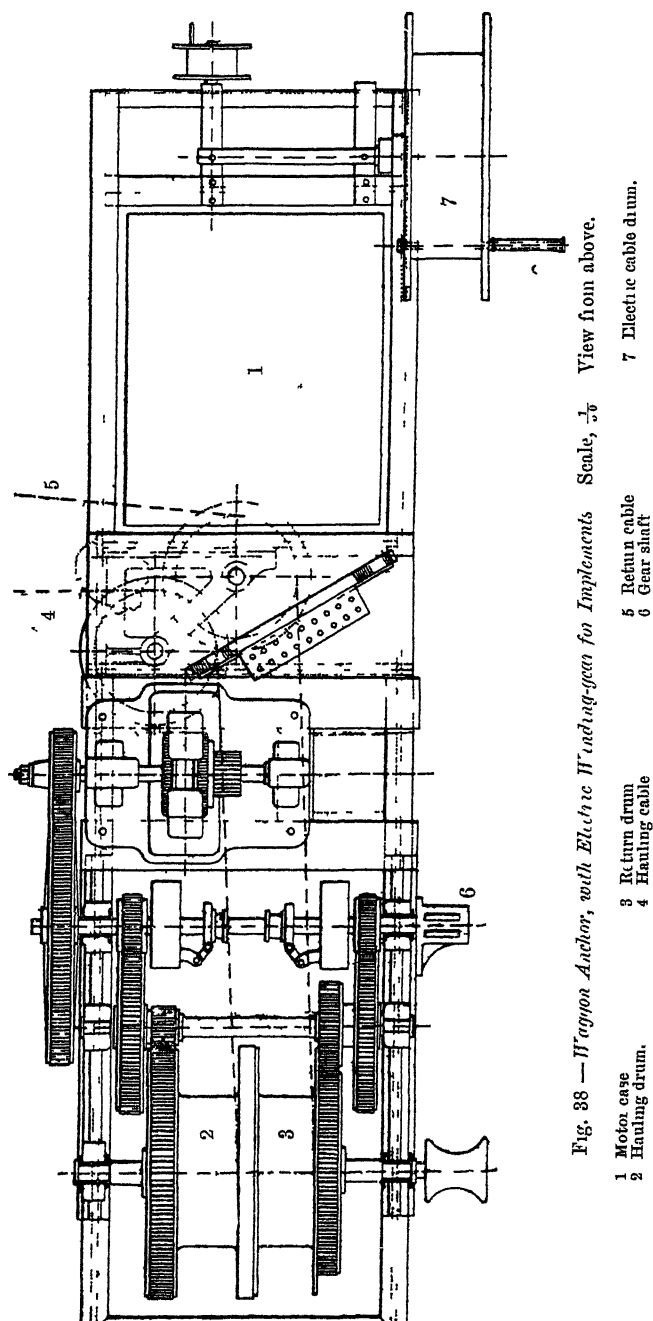


Fig. 37.—*Wagon Anchor, with Electric Winding-gear for Implements.* Scale, $\frac{1}{16}$ Side view (see fig. 38).



energy occurs in letting the plough run back empty, but there is also a loss of both in hauling forward an additional waggon-anchor in the place of the three light anchors 6, 6, and 8, which to some extent counterbalances it. In the trials made to test the loss of energy between the dynamo and that effectively used, the satisfactory result of .71 was obtained. Of course future endeavours will be directed towards increasing this, and a good field is opened to our engineers.

Several trials to test the amount of electric energy expended while ploughing have been made, the results of which are given below. The soil was a loam, somewhat moist, and stuck to the wheels and other parts of the plough, so that it did not run quite clean.

| | | | | | |
|---|-----------|----------------|---|---|----------|
| The amount of work done in an hour was | . | . | . | . | 400 mq. |
| Do. do. in 10 hours was | . | . | . | . | 4000 mq. |
| The speed of the plough whilst turning a furrow was | 26.50 m. | per minute. | | | |
| Do. do. returning empty was | 87 m. | | | " | |
| The depth of the furrow | . | . | . | . | 0.60 m. |
| The width do. | . | . | . | . | 0.50 m. |
| The dynamo with plough at work indicated | 375 volts | at 35 amperes. | | | |
| Do. do. returning empty | 375 | " 16 " | | | |
| The motor with plough at work | 325 | " 35 " | | | |
| Do. do. returning empty | 350 | " 16 " | | | |
| Do. do. returning without load | 375 | " 3.5 " | | | |

The volts represent the electric motive force, and the amperes the strength of the current. The energy actually employed in hauling the plough, and instances where loss was wasted or expended in actuating parts, are shown in the subjoined readings.

If we take the efficiency of a dynamo as $81\frac{1}{2}$ per cent, which corresponds to 600 watts per *cheval-vapeur*, the work used up at the shaft of the turbine by the generating dynamo will be—

$$\frac{375 \times 35}{736 \times .815} = 21.8 \text{ cheval-vapeur.}$$

To convert the *cheval-vapeur* into English horse-power, substitute 746 for the 736, when the number of horse-power will be rather less.

The electrical energy actually transmitted to the overhead cable is—

$$\frac{375 \times 35}{736} = 17.8 \text{ ch.}$$

On arrival at the motor the energy is—

$$\frac{325 \times 25}{736} = 15.5 \text{ ch.}$$

The efficiency of the dynamo being 81.5 per cent. the work

done by the windlass on the shaft of the motor is $15.5 \times .815 = 12.6$ ch. Hence the efficiency of transformation of electrical energy into mechanical work is $\frac{12.6}{17.8} = 71$ per cent.

The possibilities of electric power as a help to the farmer are more than foreshadowed in the results obtained by M. Plat. The avoidance of the heavy trampling of the land by horses, and of its compression by heavy engines, are matters of considerable importance to the farmer. The fact that such a high percentage of transported force can already be utilised, indicates the practical utility of transmitting power generated by water through the agency of electricity to distant points. Hitherto water-power has been regarded as a great force applicable only at points within the course of the stream, necessitating "work" to be brought to it. Now the force can be taken to the work wherever the work lies.

The association of the turbine with the electric motor shows how important and valuable a stream on the farm may be rendered, even if only employed for the minor operations on the farm; but there is every reason to suppose that our engineers will not rest satisfied with this, and that they will, as their experience increases, provide efficient machines for all kinds of work. Seeing what the possibilities of electricity are, it is highly probable that streams which have hitherto been regarded merely as convenient fences or drinking-places for cattle, will be called upon to supply force which will set in motion the greater part of the machinery of the farm, and tend to the more profitable cultivation of the soil.

In a country so well watered and so intersected by streams as this island of ours, it may not be outside the bounds of possibility that there is in the utilisation of the power generated by them and transmitted through electricity, the means by which farmers may more successfully compete with farmers in distant countries, favoured in other respects, but deficient in water-power, as are many of the great competing countries. The utilisation of other forces probably appeared as unlikely of general adoption when first mooted, yet they have been accepted; while the greater development in machinery in other respects certainly lends encouragement both to the farmer and to the engineer.

Since man first dug, it has been shown that he has subjugated animals, wind, water, steam, and explosive substances to his use, and has employed them profitably on the farm. Having done all this, there seems little to prevent his turning to profitable account another force which is the product of natural forces around him, and which he has already proved to be tractable.

THE LATE MR AMOS CRUICKSHANK.

HIS WORK AS A BREEDER.

By ROBERT BRUCE, Dublin.

IN some notes upon "Scotch Shorthorns" in the 'Transactions' for 1894,¹ reference is made to the part which the Sittyton herd played in the improvement of the cattle stock of the country, and in maintaining and extending the character of the shorthorn breed itself. Little was said as to the man to whom we are mainly indebted for the great influence which that herd exerted. It was remarked that "volumes might be written of the doings of Amos Cruickshank, and then much would be left untold. Every one who has been privileged to know this great and able man knows his innate modesty. Had he possessed this lovable and rare disposition in a less degree, his great work and its widespreading influences would have been earlier acknowledged, and the final reward, from a money point of view, substantial as it was, might have been infinitely greater." It was out of respect to Mr Cruickshank's rare native modesty that so little was on that occasion said of himself personally. Yet we know there are many who would fain learn more of his life and work on that Aberdeenshire farm which he made familiar in name in many countries. It is well for the rest of mankind to look closely into the lives of great men, for there one may find at once the safest guide and the strongest stimulus to worthy achievement.

In view of these considerations, the subject of this paper was deemed one well worthy of fuller notice in the 'Transactions' of the National Agricultural Society of Scotland.

It is with mixed feelings that I approach the subject, for some one better qualified might have been selected to do honour to the memory of one whose name is and long will be, in a special degree, associated with shorthorns wherever they are spoken of throughout the world.

Employed by Messrs James Nelson & Sons of Liverpool in the purchase of cattle, first for North and afterwards South America, I purchased in the early summer of 1889 the entire herd at Sittyton, and principally because of the financial troubles in Buenos Ayres the larger portion of the cattle remained on the farm till May of 1890. This entailed on my part frequent visits to Sittyton, and brought me in close contact with Amos Cruickshank, and resulted in a close friendship which con-

¹ Vol. vi., Fifth Series, p. 271.



1925

MR AMOS CRUICKSHANK, SITTYTON.

tinued, by a regular correspondence, until his death. Although with diffidence, yet with the greatest pleasure I comply with the Editor's request for this paper, my only regret being my inability to do that justice to the subject which it eminently deserves.

Amos Cruickshank was born at Kinmuick, near Inverurie, in 1808, and in 1837 became tenant of Sittyton, a farm adjoining the home policies of his proprietor at Straloch.

We find that he at once began to form a herd of pure-bred shorthorns, and in this he was joined by his brother Anthony, who was in business in Aberdeen, and whose assistance must be fully recognised as we come to consider the Sittyton herd and its influence at home and abroad.

Some idea of the enthusiasm Amos Cruickshank brought to bear on cattle-breeding may be gathered from the interesting incident he related to me while speaking of his first visit to Lenton to inspect Mr Wilkinson's herd. He said, "After seeing the cattle I was so excited that when I tried to write to Anthony at night I could not use a pen; I had to write with a pencil."

Few even of Mr Cruickshank's intimate friends could have supposed that his slow-beating steady-going pulse could have been roused to a degree to cause his muscular arm and hand to shake so that he had to lay aside a pen and take to a pencil when writing about cattle; but the fact that it did so gives us a slight insight to the earnest enthusiasm which he possessed, or perhaps, I should rather say, which possessed him. Knowing as we now do the steadfast and, we might almost say, tenacious way in which Mr Cruickshank stuck to his own ideal of what constituted a good shorthorn, we will all be ready to acknowledge that he had a clear conception of such, but that the inspection of animals which approached his standard could ever have roused him to such a state of excitement was a revelation which is interesting and suggestive. Need we wonder that such a man succeeded as a breeder?

We have seen that in shorthorn-breeding Mr Cruickshank was assisted by his brother Anthony; and the value of this assistance can be more readily understood when we consider the business qualifications and ample means Anthony Cruickshank brought to bear upon the enterprise.

While Amos Cruickshank was silent to a degree, and to all but to those he was intimately acquainted with reticent and taciturn, Anthony was quite the reverse. Combined with his love for shorthorns, Anthony's business experience led him to arrive at conclusions with greater promptitude than his brother, and he was always willing to give information and speak at length on shorthorn subjects. His purse was ever ready when

he fancied a bull, and but for the fact that its depth was considerable, many of the bulls that went to build up the foundation of the Sittyton herd would, in all probability, never have put a foot in Scotland.

That all the high-priced bulls Anthony Cruickshank was the means of bringing to Sittyton were such as Amos would have bought cannot for a moment be supposed; and while, as has been said, "the two brothers worked in unbroken harmony," an expression used by Amos while talking to me of the many bulls bought in the early days of the herd, showed that the judgment of the brothers did not correspond in every case. While going carefully over the bulls brought to Sittyton from a list I had prepared with the view of having Mr Cruickshank's opinion of the animals, I had mentioned several in succession which he had dismissed with the simple statement "He did no good." In the case of one, however, he added, "But Anthony was not to blame for that one."

Many an hour he and I talked of shorthorns, with his full permission to take notes, and the above was the only suggestive reference he ever made about bulls brought to Sittyton by his brother which he did not approve of.

That Anthony sometimes bought females which Amos would not have done there is no doubt; and that fashion had a greater influence on the former than the latter, was gleaned from the fact that "Anthony blamed me greatly for not buying some of the Duchess family at Thomas Bates's sale."

The ultimate influences on the herd of such animals as were at the time considered as being of little if any good cannot possibly be determined. And it is possible to conceive that much that was valuable in the herd, when it came to be looked upon as self-sustaining, may have in the first, and even the immediately subsequent generations, been present only in a latent degree.

Anthony Cruickshank was in an infirm state of health for several years prior to his death in 1879, and the management of the herd may be said to have been entirely under the control of Amos Cruickshank from about the year 1863. From about 1873 till its final dispersal the herd was self-sustaining; and the fact that it became so was of the utmost importance, seeing its destinies were guided by one whose abilities as a breeder entitle him to a place at the very top of the list of famous breeders of shorthorn cattle.

Without a certain concentration of blood—let it be called "in-breeding," "line-breeding," or "in-and-in-breeding"—no herd or family of cattle can ever be expected to exert a lasting influence upon our breeds of cattle, and the carefully blended concentration of blood in the Sittyton herd may now be justly

spoken of as its most valuable property. It is not too much to claim that what is now known as Cruickshank blood has done more for the shorthorns of Great Britain than any other sort or strain. One can hardly fancy what the present position of the shorthorn breed throughout the world would have been to-day but for the genius and ability of the late Amos Cruickshank. While quite ready and willing to accord all honour and credit to those breeders in the earlier decades of the century who made the breed of shorthorn cattle so famous throughout the world, it may be pointed out that theirs was an easier task than that which fell to the lot of Amos Cruickshank. They performed before an appreciative audience. The field was open to them, and there were no fixed prejudices backed up by interests of rival strains to combat. A few prizes won at our national shows when competition had not assumed the proportions it has done in later years, gave herds a position and a name which now seem wonderful, and can only be accounted for by the fact that cattle reared and prepared for the purpose of winning prizes in our great breeding showyards was a new departure, and one which thoroughly answered its purpose.

If, again, it be considered that those earlier breeders above referred to had, comparatively speaking, free hands, so that they could use sires and breed from dams without a written history, but of whose individual qualifications they had direct evidence, the advantage they thus possessed over later breeders can readily be seen.

From the time that Amos Cruickshank decided upon making the Sittyton herd self-sustaining through the use of home-bred sires, until almost the time his cattle were sold, it was with him one long-continued uphill battle.

Having a clearly defined object in view, neither the enormous prices certain strains of blood commanded, nor the unanimous approval accorded by the agricultural press to fashionable pedigree breeding, had the slightest effect upon his actions. It is touching to pause and for a moment consider what this great man's feelings must have been to see his young bull stock, and more especially his surplus heifers, year by year leave the land of their birth to go to Canada and the United States, when he must have felt they ought to be retained at home, where they were so much needed. This had continued so long that, when at last he determined to sell his herd, I am quite satisfied he was to a great extent unaware of the change which for a few years previous to 1889 had been gradually but surely taking place in the shorthorn world. From many remarks he made to me, I could gather that he felt a public dispersal of his herd could only have been a matter of almost local interest. That

such would not have been the case I had ample proof, as no sooner had the cattle been bought than I had, as agent in the transactions, letters from all quarters of the kingdom, as well as from North and South America, inquiring if any of the cattle were for sale.

As has been told, the Messrs Nelson fully intended to ship the whole herd to South America except a few of the older cows, but the financial crisis in the Argentine led to somewhat forced sales at home. The effect of these home sales upon the breed as a whole is daily more and more seen and appreciated; and it is not too much to say that the Cruickshank cattle and Cruickshank blood have been an untold blessing in the short-horn world. Since 1894, when, writing upon Scotch shorthorns in the pages of this publication, I drew attention to the position the cattle of Cruickshank blood had taken in the Southern showyards, their record has been an almost unbroken series of victories. It must have been gratifying to the quiet unassuming old man to hear how the Cruickshank cattle at Bapton figured in the great national shows of 1894—winning prizes and championships till their doing so came to be looked upon as a matter of course; how at the Royal Counties Show of that year, at the Bath and West, the Royal and the Yorkshire Shows, animals of Sittyton blood carried almost everything before them.

It is not given to every great improver to see his life-work so fully appreciated as Amos Cruickshank did, and only those who knew him intimately understood how carefully he followed the doings of his stock after they passed into other hands.

Believing that a record of the sales of bulls, cows, and heifers, sold for breeding purposes from the Sittyton herd from the year 1842 to 1876, when the surplus stock were all sent abroad, will be interesting, I give it here in a rather extended form (p. 219).

A summary of the table shows that in thirty-five years, from 1842 to 1876 inclusive, there were sold for breeding purposes—

| | | |
|-------------------------------|------------------------------|-----------------|
| 1030 bulls for . . . | £37,737, or at an average of | £36 12 9 |
| 321 cows and heifers for | 10,510, " " " | 32 14 9 |
| <u>1351 animals for . . .</u> | <u>£48,247, " " "</u> | <u>£35 14 2</u> |

It is almost unnecessary to state that the above figures do not include the numbers or values of animals sent to the butcher.

From 1877 to 1889, when the herd was sold, the whole of the young bulls, after a few regular customers were supplied, were sent to Canada and the United States, while the surplus heifers were also exported.

It is a matter of regret that there is no record of the sales from the herd after 1877.

We may, however, arrive at a comparatively accurate estimate

| Date. | | | | £ | s. | d. | Average. | £ | s. | d. |
|--------|------|--|---------------------|------|----|----|----------|----|----|----|
| Oct. | 1842 | By auction | 6 bulls | 121 | 4 | 6 | | 20 | 4 | 7 |
| " | 1843 | " | 7 " | 111 | 6 | 0 | | 15 | 10 | 4 |
| Sept. | 1844 | " | 8 " | 212 | 12 | 6 | | 26 | 7 | 6 |
| " | 1845 | " | 9 " | 260 | 8 | 0 | | 28 | 11 | 5 |
| " | 1846 | " | 11 " | 359 | 13 | 0 | | 32 | 13 | 7 |
| " | 1847 | " | 11 " | 472 | 9 | 0 | | 42 | 17 | 6 |
| " | 1848 | " | 20 " | 630 | 0 | 0 | | 31 | 10 | 0 |
| " | 1849 | " | 18 " | 621 | 14 | 0 | | 34 | 13 | 0 |
| " | 1850 | " | 18 " | 432 | 12 | 0 | | 24 | 0 | 8 |
| " | 1851 | " | 17 " | 459 | 10 | 0 | | 27 | 0 | 0 |
| Oct. | 1852 | " | 29 " | 647 | 17 | 0 | | 22 | 6 | 9 |
| " | " | " | 11 heifers | 158 | 11 | 0 | | 14 | 9 | 0 |
| " | 1853 | " | 33 bulls | 1157 | 9 | 0 | | 36 | 13 | 0 |
| Sept. | 1854 | " | 34 " | 916 | 16 | 0 | | 27 | 0 | 0 |
| Spring | 1855 | Privately | 16 " | 552 | 13 | 0 | | 34 | 10 | 0 |
| Oct. | " | By auction | 17 " | 681 | 10 | 0 | | 40 | 1 | 9 |
| " | " | " | 7 heifers | 208 | 9 | 0 | | 29 | 17 | 0 |
| " | " | Subsequently | 9 bulls | 314 | 15 | 0 | | 34 | 19 | 0 |
| " | 1856 | By auction | 24 " | 1014 | 16 | 0 | | 42 | 5 | 0 |
| " | " | " | 10 heifers | 285 | 2 | 0 | | 28 | 10 | 0 |
| " | 1857 | " | 31 bulls | 1197 | 0 | 0 | | 38 | 12 | 0 |
| " | " | " | 8 heifers | 270 | 18 | 0 | | 33 | 17 | 3 |
| " | 1858 | " | 32 bulls | 956 | 11 | 0 | | 29 | 17 | 0 |
| " | " | " | 11 heifers | 302 | 8 | 0 | | 27 | 9 | 9 |
| " | 1859 | By auction and privately ¹ | 77 bulls | 2902 | 18 | 0 | | 37 | 14 | 0 |
| Spring | 1861 | | | | | | | | | |
| " | " | " | 12 heifers | 430 | 6 | 0 | | 35 | 10 | 6 |
| Oct. | " | By auction | 24 bulls | 1065 | 15 | 0 | | 44 | 8 | 0 |
| " | " | " | 5 heifers | 161 | 14 | 0 | | 32 | 7 | 0 |
| " | 1862 | " | 27 bulls | 939 | 4 | 0 | | 31 | 13 | 0 |
| " | " | " | 8 heifers | 202 | 13 | 0 | | 25 | 6 | 0 |
| " | 1863 | " | 28 bulls | 954 | 0 | 0 | | 34 | 7 | 0 |
| " | " | " | 5 heifers | 89 | 5 | 0 | | 17 | 17 | 0 |
| Spring | 1864 | Privately | 18 bulls | 553 | 0 | 0 | | 30 | 14 | 0 |
| Oct. | " | By auction | 20 " | 733 | 19 | 0 | | 36 | 13 | 0 |
| Spring | 1865 | Privately | 23 " | 817 | 9 | 0 | | 35 | 10 | 0 |
| Oct. | " | " | 18 " | 802 | 5 | 0 | | 43 | 9 | 0 |
| Spring | 1866 | " | 19 " | 590 | 14 | 0 | | 31 | 1 | 0 |
| Oct. | " | " | 12 " | 555 | 10 | 0 | | 46 | 6 | 0 |
| Spring | 1867 | By auction | 28 " | 1457 | 18 | 0 | | 52 | 13 | 0 |
| March | 1868 | " | 37 " | 1707 | 11 | 0 | | 46 | 3 | 0 |
| " | " | " | 13 heifers | 392 | 14 | 0 | | 30 | 4 | 0 |
| " | 1869 | " | 49 bulls | 1866 | 18 | 0 | | 38 | 2 | 0 |
| " | " | " | 35 heifers | 851 | 12 | 0 | | 24 | 7 | 0 |
| " | 1870 | " | 35 bulls | 1391 | 4 | 0 | | 39 | 15 | 0 |
| " | " | " | 20 heifers | 434 | 14 | 0 | | 21 | 14 | 0 |
| " | 1871 | " | 38 bulls | 1760 | 17 | 0 | | 46 | 6 | 9 |
| " | " | " | 20 heifers | 598 | 9 | 0 | | 29 | 18 | 0 |
| " | " | Privately | 10 bulls | 373 | 4 | 0 | | 37 | 3 | 0 |
| March | 1872 | By auction | 33 " | 1450 | 12 | 0 | | 43 | 19 | 0 |
| " | " | " | 12 heifers | 417 | 18 | 0 | | 34 | 15 | 0 |
| " | 1873 | " | 36 bulls | 1621 | 10 | 0 | | 42 | 5 | 3 |
| " | " | " | 18 heifers | 502 | 19 | 0 | | 29 | 0 | 0 |
| " | " | " | 60 cows and heifers | 2226 | 0 | 0 | | 37 | 2 | 0 |
| March | 1874 | " | 51 bulls | 1714 | 13 | 0 | | 31 | 5 | 4 |
| " | " | " | 13 heifers | 376 | 19 | 0 | | 28 | 19 | 6 |
| Dec. | " | " | 50 bulls | 1735 | 13 | 0 | | 34 | 14 | 3 |
| " | 1875 | " | 26 " | 895 | 13 | 0 | | 34 | 9 | 0 |
| May | 1876 | " | 45 cows and heifers | 2425 | 17 | 0 | | 53 | 18 | 0 |
| Oct. | " | " | 21 bulls | 819 | 18 | 0 | | 38 | 18 | 0 |
| " | " | " | 8 heifers | 174 | 6 | 0 | | 21 | 15 | 9 |

¹ The sales by auction and the private sales in 1859, 1860, and the spring of 1861, are here grouped together, as they are not distinctly separated in the otherwise carefully kept sale records.

of the total number of the bulls sold from the herd during the twelve years preceding its disposal. It is considered within the mark to put them at 360, an average of 30 for each year. Having no record of the prices realised, but taking the average result of the twelve preceding years as a basis, it will indicate that bulls to the value of £13,171, 10s. were sold.

If the total number of heifers sold during these twelve years be put at one-half that of the bulls, a reasonably accurate total result of the entire sales from the herd previous to the final disposal may be arrived at. Taking, therefore, as the value of heifers sold from 1877 to 1889 the sum of £6585, 15s., the figures stand thus:—

| | | | | | |
|--|---|---|----------------|----------|----------|
| 1372 animals sold from 1842 to 1867 | . | . | £48,247 | 0 | 0 |
| 540 " " " 1867 to 1889 | . | . | 19,757 | 5 | 0 |
| <u>1912</u> Total for forty-seven years' sales | . | . | <u>£68,004</u> | <u>5</u> | <u>0</u> |

In going carefully over the sale records, I found that quite 95 per cent of the entire number of bulls sold from Sittyton were purchased by farmers to go into herds of cross-bred cows. An equally careful estimate of the prices paid by farmers for 989 bulls, solely for crossing purposes, gave a total of £33,133, or an average of a trifle over £33, 10s. Apart, therefore, altogether from the direct influence the Sittyton herd exercised upon the pure-bred herds throughout the country, the effect it had upon the ordinary cattle of the North of Scotland must have been great almost beyond conception.

The average prices paid by the cross-breeding farmers is a sure and definite indication that, for the long period of thirty-five years, the Sittyton bulls were highly valued by them. It is still more interesting to find that during the few years of highly inflated prices for certain families of shorthorns, which led to a decreased demand for Sittyton bulls from breeders of shorthorn herds, the averages were well maintained through the keen demand for farmers' bulls.

In the strains, or families, of cattle Amos Cruickshank evolved through a careful blending of blood from the best herds in the kingdom, and a long-continued system of careful concentration of the best blood obtained through such blendings, he left to his country a rich legacy. That such a legacy came at an appropriate time there can be no question.

Owing to the fact that for so many years the surplus stock from Sittyton were sent abroad, there were few Cruickshank animals in this country outside the parent herd when it was finally broken up.

Those breeders who possessed a strong infusion of Sittyton blood in their herds have reaped a full and well-earned harvest; but the value of such a harvest is small indeed compared with

the total sum of the legacy just spoken of. It may be at once acknowledged that the style of animal produced at Sittyton was so pre-eminently useful that it lacked the power to charm, such as was possessed by Bates's cattle, and described by a Bates breeder, who said, "I have no inclination to kiss one of those North Country cows, such as I have when I look at my own!" Breeding cattle fit to be kissed may be all very well as a hobby, but the legacy Amos Cruickshank has left will do much to assist the British farmers to pay their rents, if we are to judge of this from the enormous increase in money value of the ordinary farmers' stock in the district which came more immediately under its influence during the fifty years the Sittyton herd was in existence.

As a neighbour and a friend Amos Cruickshank was highly esteemed and beloved. In the quiet retired life he led, there was little apart from his work as a breeder upon which the historian could dilate or enlarge. From year's end to year's end he found his work on the farm of Sittyton sufficient to engage his attention and occupy his time. While this was so, and while less seen than most of his neighbours at many of those popular gatherings of distinctly local or county interest, he nevertheless was to be met at the side of many a distant shorthorn sale-ring. At one time or another he had seen most of the famous herds in the kingdom, and seeing a herd meant more to him than to many. That such was the case was evident in the minute manner he spoke of cattle he had seen when discussing them with me after a lapse of thirty or forty years.

As a master Mr Cruickshank was beloved and respected by his servants, whose interest in their work and their employer was seen at every hand. A neighbour of his writes: "At one time, when he had a number of unmarried servants boarded in the kitchen, he arranged to have a portion of the Bible read to them every night; and an old foreman told me how impressed he was with the discussions which often took place between master and servant at the kitchen fireside at Sittyton. Few men knew their business better than Mr Cruickshank, and none conducted it more ably and with less fuss. He knew a day's work when he got it, and could appreciate good service. He got more work out of his men than any man I know, and with no words. On one occasion he was observed by a visitor to be keeping an eye on a man lately come to Sittyton, and whose pace while carting turnips evidently did not quite satisfy him. As the man approached them with his carts, Mr Cruickshank cut a twig of broom from a bush on the roadside, and handing it to the new horseman, said quietly, 'Thee must quicken thy pace.' Not only in his servants, but also in their families, he took a personal and practical interest; and as the boys grew up it was

interesting to observe how they delighted to attend on Mr Cruickshank."

During the twelve months the herd remained on the farm after the cattle became the property of the Messrs Nelson, many of my friends, interested in shorthorns, accompanied me in my visits to Sittyton. They were all greatly struck with the boys on the farm, and with their intimate knowledge of the breeding of the cattle. "Johnnie will go with you, he knows them *all*," was the quiet remark of the old man—a remark that was acknowledged with a proud smile by the ten-year-old guide, who never faltered when appealed to, even when family names had been adhered to and numbers were the distinguishing mediums. There were several families of cows known by their numbers, and one of them, the Duchess of Glo'ster sort, was differently spoken of in this way: the 20th Duchess or the 30th Duchess, while the other families were designated Victoria the 70th, or Nonpareil the 12th or 15th, and so on. This was how Mr Cruickshank spoke of them, and these little lads, who had the numbers at their finger-ends, never once said Duchess the 20th or the 15th Nonpareil.

In showing his cattle Mr Cruickshank rarely expressed an opinion about them, although to one who was intimate with him his favourites could be easily recognised by the way he looked at them, and by the glance of appeal which indicated a wish to hear the visitor's criticism.

The correspondent I have before quoted again writes: "I was often struck with the correctness of Mr Cruickshank's judgment of his young stock as proved by time. Well do I remember going through the cattle at Sittyton with a gentleman who had some reputation, and certainly considered himself a judge. His criticisms were free and frequent, and chiefly unfavourable. I shall never forget the patience of Mr Cruickshank, or his quiet manner. He neither dissented nor attempted any defence of his cattle. Old Cumberland (the principal stock bull) got it badly, and Mr Cruickshank listened apparently unmoved, but knowing him as I did, I could discern a certain expression of amusement in his face; and once or twice when he was directly appealed to there was a touch or grain of sarcasm in his replies which the stranger did not appear to observe."

These sentences give an insight into the character of the man who, strong in his own opinions, yet could silently hear his life's work pulled to tatters by one who no doubt felt he was shedding light in thus freely expressing his opinions. A cow called *Campion* was looked upon as being the most perfect show female at Sittyton, and while being inspected by several gentlemen who had met at the farm and were "doing the herd," one of them pulled a tape from his pocket, and after measuring the girth of the cow, remarked he had a cow which measured two

inches more. "Thee would not care to exchange cows, perhaps, wouldst thee?" was the quiet remark of the owner of the beautiful cow.

Mr Cruickshank's house and its surroundings clearly indicated his simple yet careful manner of life. Again I quote: "Mr Cruickshank's life was remarkably plain and simple. The house itself was an indication of the tenant—solid and substantial, without show or decoration. Inside the rooms were always tidy, everything was in its place, few ornaments were displayed; the wall pictures consisting of a few favourite prints, the gifts of friends, and cherished on account of the givers. A good fire, a comfortable easy-chair, and the warmest of welcomes prepared the visitor for the genuine sociality of which he was made the partaker. Mr Cruickshank rose early in the morning and retired early at night—took his meals with perfect regularity. His food was plain, but good and wholesome. Strong drinks, even wines and beer, he eschewed, and never presented to visitors what he did not consider good for them or himself. At the great sales at Sittyton the luncheon was always abundant and good, but of intoxicant drinks there were none. He loved flowers and took a great interest in his garden, and enjoyed greatly giving his friends slips of his favourite plants. It pleased him to see his visitors heartily enjoy his beautiful gooseberries. In the animal world of course the shorthorns were his prime favourites, and next in order I think horses; but poultry, pigeons, &c., all found a place in his big heart."

Can any one realise what the selling of his entire herd of shorthorns would mean to such a man, a herd which had been the work of a lifetime to build up? While the transaction was being carried through I felt sincere sympathy for him, as I could see how the thought of parting with his cattle affected his strong mind. The resolution to sell was arrived at owing to his failing health, and the fact that the lease of his farm had expired; and when the proposition of a private purchase of the entire lot was made he liked the idea, seeing it would save him all the worry and trouble attending a public sale. In a letter to me, dated May 5, 1889, he wrote: "In reply to your letter regarding the shorthorned cattle, my lease of the farm expires next year. I am in my eighty-second year, and from a serious illness which I had last year, I am not now able to give the cattle that attention which I had used to do, and which is essentially necessary to continue. This is the cause of their being offered for sale."

Some considerable time before he came to say the bargain was completed, I understood he was going to accept the offer made for the cattle, and I will never forget the expression of his face when he finally agreed by saying, "the cattle are thine." Nor will I forget the change from evident despair to joy when

the proposition was made to him that a large proportion of the herd should remain at Sittyton for nine or ten months, so as to suit the shipping arrangements of the purchasers. His face beamed again at the thought of being able to have a number of his cattle on the farm till the time he then believed he should leave Sittyton. At the desire of his landlord, however, Mr Cruickshank afterwards arranged to continue in Sittyton as a yearly tenant.

On one of the days of the Highland Show at Aberdeen in July 1894, a homely little ceremony took place which excited more than ordinary interest. From the Royal Box in the Grand Stand his Royal Highness the Duke of York, President of the Society for the year, was witnessing the parade of the live stock. Some one mentioned to his Royal Highness that not far away on the stand a seat was occupied by that prince of cattle-breeders, Amos Cruickshank, Sittyton. At once his Royal Highness desired that Mr Cruickshank be summoned to the Royal Box. The octogenarian farmer and breeder, presenting a characteristic figure with his quiet attire, long white locks, and strong modest face, obeyed the Royal command, and was received most cordially by his Royal Highness. This incident, simple and interesting in itself, gave unbounded pleasure to the crowd of onlookers, who applauded warmly as the venerable breeder was seen to make his way back from the presence of Royalty. It was a singularly happy occurrence that meeting of the youthful Prince and the patriarchal farmer,—one of many similarly happy incidents which illumine and distinguish the movements of the Royal Family, demonstrating their ever anxious desire to recognise and duly honour noble achievement in whatever walk of life it may be observed.

Amos Cruickshank was then in his eighty-sixth year. Although bowed down with the weight of years, he was not unnaturally anxious again to witness the Highland Show—
anxious in particular that he might see the Royal Duke who had honoured Scotch agriculturists by becoming the President of their National Agricultural Society and arranging to visit its Show in the Granite City. Happily Mr Cruickshank's desire was fulfilled, and by the incident just mentioned an honour was added which he had not dreamt of, but which deeply gratified him. Talking over the honour done him, he said to me, "I feel gratified, deeply gratified, but had I known what was before me I could never have left Sittyton."

Mr Cruickshank lived several months longer, and when he passed away, in May 1895, at the ripe old age of eighty-seven years, it was felt by the agriculturists of Scotland that there had gone from their midst a notable man whose great work as a short-horn breeder would long redound to the credit of his country.

FAT FORMATION IN THE ANIMAL BODY.

AN ACCOUNT OF EXPERIMENTS ON THE SOURCES IN
THEIR FOOD OF THE FAT FORMED BY OXEN.

By JAMES HENDRICK, B.Sc., F.I.C., F.C.S.

INTRODUCTION.

EXACT feeding experiments upon animals, and especially upon the larger farm animals, are extremely laborious and expensive. A good many experiments have been carried out in Britain on the feeding value of different foods. Such work is of considerable importance, and is comparatively easy. Rothamsted, however, is the only British station where any serious experimental research has been carried out on the feeding of farm animals in its scientific and not merely in its economic aspects.

Rothamsted Views opposed to those of Munich on Fat Formation.—As a result of the conclusions which they drew from the Rothamsted experiments, Lawes and Gilbert found themselves in opposition, on the question of fat formation in the animal body, to a very large section of physiologists, who based their opinions primarily on the experiments carried out at the Physiological Institute at Munich. This question has now been a subject of controversy for more than a quarter of a century. The great British experimenters have recently given a *résumé* of the whole subject and a clear statement of their views, strengthened by a recalculation of the results of their experiments in the light of the most recent knowledge.¹ Meantime opinion has been steadily swinging round to their point of view.

The Question held to be still an open one.—Still, a very large section of scientists have always refused to accept the results of the experiments of Lawes and Gilbert, or of any other similar experiments, as conclusive, and have proclaimed the question of fat formation to be an open one requiring further investigation. Thus the leading treatise in English on the subject states: "It must be admitted at once that the data now at our command are not sufficient to enable us to solve the problem. No thorough and accurate scientific study of the subject has yet been made, if we except Pettenkofer and Voit's experiments on dogs"² (the Munich experiments). Many have refused to give weight to the Rothamsted experiments on this subject since they were performed so long ago—1848-1853—but more especially since

¹ Transactions, this Society, Fifth Series, vol. vii., 1895, pp. 284-314.

² Manual of Cattle-Feeding. By H. P. Aimsly, Ph.D., fifth ed., p. 184.

they were performed without the aid of the respiration-chamber, and therefore all the evidence of fat formation is necessarily obtained somewhat indirectly.

Work with the Respiration-Chamber demanded—Repeatedly it has been asserted that this question could never be satisfactorily settled until a thorough series of experiments were made on farm animals with the respiration-chamber. Such experiments cannot be lightly undertaken, as the use of the respiration-chamber enormously increases the cost and the difficulty, as well as the accuracy, of such experiments.

The Demand supplied.—We have, however, at last obtained the results of a series of experiments which should finally settle this point, and prove to the satisfaction of those who demand evidence obtained with the respiration-chamber that Lawes and Gilbert have been right all along in maintaining that much of the fat of farm animals can be and is derived from the carbohydrates in their food.

Professor G. Kuhn and his work.—One of the best-known German workers on animal physiology, especially in its bearings on agriculture, is the late Professor Gustav Kuhn. To his work we owe a great deal of our knowledge of the digestibility of the constituents of various farm foods. After his death it was found that he had left behind not only a large amount of unpublished work on the digestibilities of various foods, but a great series of experiments carried on during the nine years—1882-1890—on the formation of fat in oxen. He had continued to accumulate evidence during all these years, so that when he came to publish he should have such an indisputable mass of facts as to set this phase of controversy at rest for ever. Meantime death overtook him at his work, and his posthumous papers have now been published by his successor.¹ All these experiments were carried out at the research station at Mochern, of which Dr Kuhn was the head.

The Agricultural Research Station at Mochern.—The agricultural research station at Mochern is the oldest in Germany, having been founded in 1857. It stands just outside the old university city of Leipzig, on the historic ground where some of the bloodiest fighting took place in the famous battle of 1813. This station has always been occupied with questions of animal nutrition, and from it much of our knowledge of the digestion of farm animals has proceeded.

THE METHODS OF INVESTIGATION.

Ordinary Feeding Experiments.—In feeding experiments all the solids and liquids consumed by the animal can readily be

¹ Die Landwirthschaftlichen Versuchs-Stationen, vol. 44, 1894.

weighed and analysed. It is also a comparatively easy matter to collect all the solid and liquid excretions of the animal, and weigh and analyse them. From these data, together with the gain or loss of the animal in weight during the time of the experiment, much valuable information may be gained as to the digestibility and nutritive value of the food, as to the amount of nitrogenous and ash matter laid up in the body, and even, by a somewhat roundabout method of deduction, as to the amount of fat formed in the body. The majority of scientific feeding experiments are of this nature, and their chief difficulty lies in the amount of time, labour, and attention which they require.

No Account taken of Gases excreted.—But much of what is taken into the body in the solid and liquid forms is excreted from the lungs, skin, and rectum in the form of gas. A very large part of the carbon and hydrogen of the digested food of any animal is excreted again in the breath and other gaseous emanations of the body. Therefore to completely determine, so far as it is possible with our present knowledge, the uses to which an animal is putting the various parts of its food, and especially how much non-nitrogenous organic matter it is forming in its body, it is necessary to be able to measure and analyse not only all the solids and liquids taken into and given out of the body, but also all the gases. Such experiments demand not only still more labour, but involve the use of extremely complicated and expensive apparatus.

Pettenkofer's Respiration Apparatus.—The only practicable apparatus at present known for enabling us to determine *all* the materials entering and leaving the body of an animal is that known as "Pettenkofer's respiration apparatus." This is the kind of apparatus which was used in the classical experiments of Voit, Pettenkofer, and others at Munich, and it was with such an apparatus, modified and improved in many of its details by Kuhn himself, that the Mochern experiments were carried out.

The Mochern Apparatus.—The whole apparatus may be divided into three parts, which in Mochern were kept in three separate rooms opening into one another. The apparatus is diagrammatically represented in the illustrations (figs. 39, 40, 41, and 42). In the first room is the closed stall, or respiration-chamber; in the second room the gas-meters for measuring the volume of air passing through the closed stall, and the elaborate chemical apparatus which continually carries on the necessary analysis of this air; and in the third room the steam-engine which works the ventilating-fans and other moving parts of the apparatus. The first two rooms are capable of being kept at an almost constant equable temperature by means of a self-regulating gas-heating apparatus. In this way any disturbance

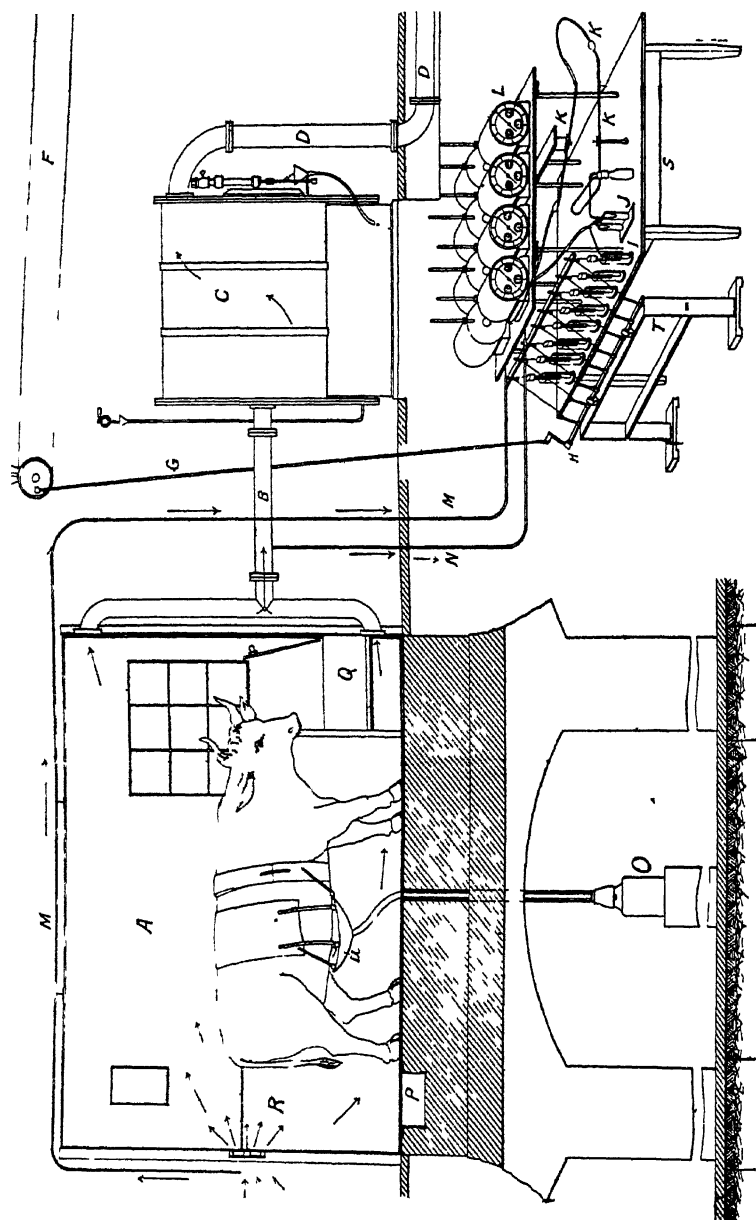


Fig. 39 — General View of the Moehrn Respiration Apparatus.

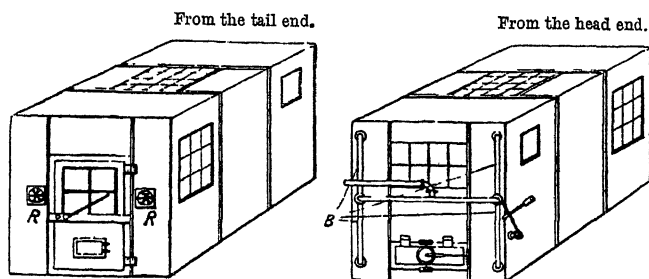


Fig. 40.—The Respiration-Chamber.

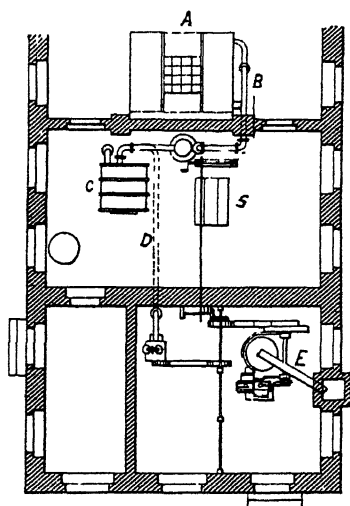


Fig. 41.—Ground-Plan of the whole Apparatus.

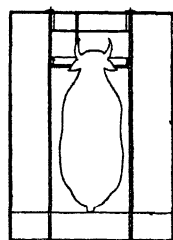


Fig. 42.—Ground-Plan of the Respiration-Chamber.

EXPLANATION OF DIAGRAMS.

- A The respiration-chamber.
- B Pipes through which the air is drawn off.
- C The large gas-meter for measuring the air leaving the chamber.
- D Pipe connecting the meter with the ventilating-fan which produces the current.
- E Steam-engine supplying power for the pumps and ventilating-fan.
- F Band from engine transmitting power to crank G.
- G and H Oscillating cranks working the mercury pumps I.
- I Eight mercury pumps drawing off samples of the air entering and leaving the chamber, for analysis.
- J Mercury valves, regulating the passage of the air samples.
- K Apparatus for the analysis of the air samples (J and K, though shown only once in the diagram, are duplicated eight times,

- one such set of apparatus being attached to each of the eight mercury pumps I).
- L Eight small gas-meters, for measuring the air samples used for analysis.
- M Pipe conveying sample of the outer air, just before it enters the chamber, to the analytical apparatus.
- N Pipe conveying similar sample of the air as it leaves the chamber.
- O Flask for collecting the urine.
- P Movable trough for collecting the dung.
- Q Movable manger, worked by levers from the outside.
- R Ventilators through which the air enters the chamber.
- S Experiment table, which holds the apparatus for analysis of the air.
- T Frame in which the oscillating crank works.
- U Apparatus fastened to the animal for collecting his urine.

of the results arising from variations of temperature affecting either the animal or the chemical measurements is almost entirely obviated.

The Respiration - Chamber.—The respiration-chamber (figs. 39-42) is a large closed box, made of iron sheets riveted together air-tight. It is 10 feet 8 inches long, and 7 feet 9 inches high and broad, and has a cubic capacity of 643 cubic feet. It is well lighted by windows in its sides and roof. All the parts which open close air-tight against india-rubber cushions, in which they are pressed by levers. The chamber is most ingeniously fitted inside and out, so that food and water can be introduced, and the dung and urine collected and removed, without interfering with the collection and measurement of the air-current. The air enters the chamber by small fanlights, R, situated at the tail end, and is drawn off by four pipes, B, at the head end. These pipes carry the air-current to the large gas-meter, C, where it is measured. When the apparatus is working a sample for analysis of the outside air is continuously drawn off by two small pipes, M, opening just outside the fanlights. Similarly samples are continuously drawn by a small pipe, N, from the large pipes by which the air leaves the chamber, and carried to the analytical apparatus. On their way all these air samples, which are eight in number, pass through small gas-meters, L, which register the amount of each sample. To ensure accuracy every part of the gas-analysis machinery is in duplicate, and duplicate determinations are made of everything. The whole of the gas-meters are tested from time to time by a gauging apparatus to make sure that they are working accurately.

A wonderful Apparatus.—It is almost impossible to convey in a description like this an idea of the perfection to which every detail of this apparatus has been brought. The greatest ingenuity has been exercised in working out every detail with exactness, and in inventing such a system of checks and counter-checks for every important part of the apparatus, that no serious source of error could arise without being at once detected. The labour involved in experimenting with such an apparatus is great in proportion to its intricacy and accuracy. Whenever an experiment was in progress the scientific staff of the station was divided into watches, one of which was always in attendance, so that everything was watched and cared for night and day.

The Animals experimented upon.—The animals used for these experiments were Bavarian oxen. These are animals of large size, such as are commonly used for draught purposes in Germany. The animals used were always quite docile and accustomed to being handled. Before beginning an experiment the animal was put through a course of training to thoroughly accustom him to his novel surroundings. He was accustomed

to be weighed and handled, and to be put into and taken out of the respiration-chamber, and to be fed in it, and shut in it with the machinery working, until he learned to make himself thoroughly at home in it. The importance of these precautions as a safeguard against the animal becoming excited during the course of an experiment, will be apparent to all practical men.

A Test of Accuracy.—Finally, before beginning an experiment, in order to make sure that all this complicated machinery was working accurately, and that no undetected leak existed in any part of the apparatus, a control experiment was done with burning candles. Instead of putting a live animal into the chamber, twenty-four burning candles of known weight and composition were introduced and allowed to burn for twelve hours, with the whole mechanism working just as if an animal were inside. Then, if the amount of gaseous matter determined by the apparatus in the air drawn off from the chamber exactly corresponded with the weight of the candles consumed during the burning, it was concluded that everything was working correctly.

Four Series of Experiments.—The experiments are divided into four series, in each of which two oxen were used, so that altogether eight animals were experimented upon. The first series was carried out in 1882-83, the second in 1883-84, the third in 1885-86, and the fourth in 1889-90.

The Fodder used.—In each series of experiments a coarse fodder was used as a ground ration, and to that was added, in due time, supplementary food. The whole of the coarse fodder to be used during a series of experiments was got in before the beginning of the series, and after being put through a very thorough mixing, was stored in a dry, well-ventilated loft. It was found by means of a careful series of analyses of the hay used in the 1882-83 experiments that, under these conditions, the fodder does not sensibly vary in composition even when kept for eight months. The mixing, too, was found to be so perfect that the analyses of samples taken from time to time showed hardly any variation. The composition of all the other feeding-stuffs used was determined by ordinary methods. Not only was the amount of water used by the animals measured, but the water itself was analysed, and the solid matters contained in it allowed for.

Experimental Details.—Besides the respiration-chamber stall there were other experiment-stalls close by in which the animals under experiment were kept when not in the chamber. These stalls, which were of the ordinary type used in feeding experiments, had arrangements for collecting the dung and urine of the animals, and for preventing waste of the weighed quantity of food provided. Whether he was in the respiration-

chamber or in one of the ordinary stalls, the dung of every animal under experiment was removed every twelve hours, mixed, and a sample taken for analysis. The urine was removed once in twenty-four hours, mixed, and a sample taken and analysed. During the whole progress of a research each animal was weighed daily on a machine kept close by the experiment-stalls.

The Method of Feeding.—In the case of each animal experimented upon the research began with a period during which the animal was kept upon a maintenance ration of coarse fodder. The coarse fodder to be used during the whole experiment was fed to the animal in such quantity as was calculated would just be about sufficient to maintain him without increase or loss of flesh. This maintenance ration was fed for a few weeks until the animal had quite come into equilibrium with it. That such an equilibrium had been attained was shown by the average weight of the animal remaining about constant over a period of days, and also by the result of experiments with the respiration-chamber which showed that very little, or no, carbon and nitrogen were being added to the body. The next step was to gradually enrich this ration with the concentrated food to be used in the experiment in question. Then followed one or more periods of a few weeks each with this enriched ration, during which the effects of the enrichment were determined. From the amounts of carbon and nitrogen daily added to the body from the enriched food, the daily increase of the body in proteid and fatty matters was calculated.

An Illustration.—As an illustration of the method followed, a few details of the first series of experiments may not be amiss.

Preliminary Treatment.—Both the oxen used for these experiments were brought under preliminary treatment on 23d June 1882. This treatment lasted till 30th August, when they were considered quite accustomed to all their surroundings. With ox I. the experiment began on August 31, when his dung and urine began to be collected and analysed daily, and 22 lb. (10 kg.) of hay of known composition fed to him each day. The first period, during which he was kept on this maintenance diet of hay, lasted till the 14th October. Of this time nine days were spent in the respiration-chamber, the rest in an ordinary research-stall. His average live-weight for thirteen days at the beginning of this period was 1582 lb., and for seven days towards the end of it 1574 lb.

Fattening Diet.—On the 15th October the ration began to be enriched by the addition of a little pure starch, which was gradually increased till 44 lb. (2 kg.) were fed daily. The starch was fed along with the hay, which was moistened with water, and had then the starch sprinkled over it. The animals

ate it readily. When the starch had been increased to its full amount the ration was kept fixed again, and the research continued. This period lasted from November 3 till February 13, and included ten days during which the ox was kept in the respiration-chamber. During this period the animal increased in average weight from 1577 lb. to 1707 lb., an average increase of about 18 oz. per day.

The Duplicate Animal.—Ox II. was similarly treated. With him the first period began on October 16 and lasted till November 11. As it was found 22 lb. of hay was too much for this animal, he only got about 20·9 lb. (9·5 kg.) per day. During this time his average weight hardly varied, remaining at about 1400 lb. After November 11 starch began to be added to his ration, and on 18th November he received the full quantity of this by-fodder, 4·4 lb. (2 kg.) This feeding was continued till December 8, during which time the weight had increased to about 1450 lb. This gives an average increase in weight of nearly 2 lb. per day for every day after starch began to be added to the food.

Pure Starch used as Food.—The starch used in this and in the other series of experiments was wheat-starch, as pure as could be obtained in the market. Analysis proved it to be an almost perfectly pure starch, containing on the average less than one-half of 1 per cent of impurities. As the main object of the whole of these experiments was to determine if fat could be formed in the animal from carbohydrates supplied in the food, an almost pure carbohydrate such as this wheat-starch formed a most valuable by-fodder with which to compound a ration calculated to cast light on the point under investigation.

THE EXPERIMENTS.

Before proceeding to a summary of the results of the whole of the experiments, it will be well to describe the principal features of the different series into which they were divided, and point out some of the interesting observations which were made in the course of them.

Digestive Coefficients.—The proportion of each of the main constituents of the fodder which was digested was determined in every case. From this the nutritive ratio of the diet was calculated in the usual way. The following table gives the digestion coefficients of the coarse fodders used in the different series of experiments:—

TABLE I.—DIGESTION COEFFICIENTS OF COARSE FODDER.

| Series | | Dry matter | Organic matter. | Crude protein | Nitrogen free extract | Crude fat. | Crude fibre. |
|--------|---------|------------|-----------------|---------------|-----------------------|------------|--------------|
| I. | Ox I. | 60.2 | 62.9 | 50.0 | 65.6 | 38.4 | 64.8 |
| | Ox II. | 60.0 | 62.3 | 51.2 | 64.4 | 40.7 | 63.9 |
| | Mean | 60.1 | 62.6 | 50.6 | 65.0 | 39.6 | 64.4 |
| II. | Ox III. | 56.5 | 58.7 | 53.2 | 61.0 | 43.8 | 57.8 |
| | Ox IV. | 56.9 | 58.9 | 53.5 | 62.0 | 45.3 | 56.9 |
| | Mean | 56.7 | 58.8 | 53.4 | 61.5 | 44.6 | 57.4 |
| III. | Ox V. | 58.4 | 60.8 | 56.2 | 60.1 | 27.2 | 63.7 |
| | Ox VI. | 61.3 | 64.1 | 57.7 | 63.4 | 32.2 | 69.3 |
| | Mean | 59.9 | 62.5 | 57.0 | 61.8 | 29.7 | 67.5 |
| IV. | Ox XX. | 64.9 | 67.0 | 57.7 | 70.1 | 49.6 | 67.0 |
| | Ox XXI. | 65.3 | 67.6 | 58.9 | 71.1 | 49.6 | 66.7 |
| | Mean | 65.1 | 67.3 | 58.3 | 70.6 | 49.6 | 66.9 |

The Digestion of Fibre.—In series I., III., and IV. the coarse fodder was hay, in series II. a mixture of equal parts of clover-hay and oat-straw. It is very noticeable that that part of a fodder which in an analysis is classed as fibre, and is often supposed to be indigestible, or nearly so, is very well digested. In series III. this was the best digested constituent of the food by both animals. In the other three series it is the second best digested constituent, being surpassed only by the nitrogen free extract. It is to be remembered, however, that the chemical methods of determining "fibre" are admitted to be very unsatisfactory and merely comparative. The chemical analysis of these fodders indicated that the hays used in series I. and III. were of medium quality, while that of series IV. seemed to be of good quality. This good quality hay is considerably better digested than the medium ones. On the other hand, the hay of series III., though an old hay, and not generally better digested than that of series I., had its nitrogenous matters much better digested, and therefore gave a better nutritive ratio, 1 : 9, than that given in series I., 1 : 11. In the third series of experiments it is noticeable that ox VI. digested his food much better than ox V. This appears to be merely an individual idiosyncrasy, and applies not only to the total food but to every individual constituent of it. In all other cases the digestion of the two animals under experiment at the same time was very similar.

Depressing Effect of Starch on Digestion.—The addition of starch to the diet of coarse fodder had always a definite effect in depressing the digestion coefficients of the other constituents. Thus the addition of starch always led to diminished digestion of the nitrogenous matters and of the fibre of the hay. The amount of fatty matter digested was also generally diminished in quantity; but as the total amount of it present in hay is very small, the determinations cannot be considered of great accuracy or importance. The starch itself was found by microscopic and chemical examination of the dung of the animals to be in every case entirely, or almost entirely, digested. As an illustration of this depression of the digestion coefficients through addition of starch to the food, the results of the third series of experiments, so far as they bear on this point, are given in Table II. In this case starch was added to the hay in two different quantities. The depression is greater with the larger quantity of starch than with the smaller. The digestion of the fat shows very uncertain results, as was to be expected from so small and uncertain a constituent.

TABLE II.—DEPRESSION OF DIGESTION COEFFICIENTS BY ADDITION OF STARCH.

| Ox. | | Crude protein. | Crude fat. | Crude fibre. |
|-----|--|-------------------|---------------|-----------------|
| V. | Hay alone, 19·8 lb. (9 kg.) | 56·2 | 27·2 | 65·7 |
| | Hay, 19·8 lb.; with starch, 4·4 lb. (2 kg.) | 69·4 | 28·1 | 59·3 |
| | Lowering of digestion coefficient | 6·8 | ... | 6·4 |
| VI. | Hay alone, 19·8 lb. | 57·7 | 32·2 | 69·3 |
| | Hay, 19·8 lb.; with starch, 4·4 lb. | 48·8 | 25·2 | 64·6 |
| | Lowering of digestion coefficient | 8·9 | 7·0 | 4·7 |
| V. | Hay, 19·8 lb.; with starch, 7·7 lb. (3·5 kg.) | 37·8 | 26·0 | 58·6 |
| | Depression | 18·4 | 1·2 | 7·1 |
| VI. | Hay, 19·8 lb.; with starch, 7·7 lb. | 46·0 | 28·8 | 62·2 |
| | Depression | 11·7 | 3·4 | 6·9 |

Remarks on Table II.—These figures show that the addition of starch widens the nutritive ratio of the food, not only by adding largely to its digested non-nitrogenous matter, but also by seriously diminishing the amount of nitrogenous matter digested from the hay. In the case of ox I. the nutritive ratio

was reduced from 1:11 to 1:15·2 by the addition of the starch. In series III. the nutritive ratio of the hay alone was 1:9, but this was reduced in the case of ox V. to 1:14 by the addition of 4·4 lb. (2 kg.) of starch, and to 1:20·9 by the addition of 7·7 lb. (3·5 kg.) of starch to the hay.

The Nitrogen and Carbon Balance.—In order to determine the amount of fat and nitrogenous matter gained or lost by the animal on the average, per day, during the course of any experiment, a balance was struck between the quantities of nitrogen and carbon consumed and the quantities of the same elements excreted by the animal. Thus the carbon obtained from all parts of the food was added up, and balanced with all the carbon excreted in the solid, liquid, and gaseous forms taken together. If these two sums are about equal, there is no carbon being added to the body. If the amount excreted exceeds in weight that consumed, the body is consuming its own substance and losing in weight. If the amount consumed exceeds that excreted, the body is adding carbonaceous matter to itself in some form. In order to determine whether this carbonaceous matter is nitrogenous matter or fat, we have to take the nitrogen balance into account, and determine in a similar way whether the animal is adding nitrogen to its body or not. To fully illustrate how the balances are made, full figures are given for ox II.

Illustration of the Method of Balancing.—For the sake of simplicity the figures are given in the metrical system, as they appear in the original.

Ox II., Period 1.

In this period the animal received per day 10 kilograms of hay, containing 8·734 kg. of dry matter. Of this he left behind hay containing 0·350 kg. of dry substance.

| | Nitrogen. Grams. | Carbon. Grams. |
|---|---------------------|-------------------|
| Taken into the body— | | |
| From 8·734 kg. dry matter of hay | 137·1 | 4036·9 |
| Subtract 350 kg. " " " not eaten | 8·0 | 150·9 |
| Consumed from the hay | 129·1 | 3886·0 |
| From 22·84 kg. water consumed | ... | 1·6 |
| Total consumption | 129·1 | 3887·6 |
| Given out from the body— | | |
| From 3·357 kg. dry matter in dung | 63·1 | 1595·2 |
| " Organic matter and carbonates in urine | 65·9 | 202·7 |
| " Gaseous excretions, chiefly respiration | ... | 2021·4 |
| Total excretion | 129·0 | 3819·3 |
| Excess of consumed over excreted— | | |
| Added to the body | 0·1 | 68·3 |

Ox II., Period 2.

In this period the animal received in addition to the hay 2 kg. of starch, containing 1.694 kg. of dry matter.

| Taken into the body— | | | | Nitrogen. Grams. | Carbon. Grams. |
|-----------------------------------|---|---|---|---------------------|-------------------|
| From 8.302 kg. dry matter of hay | . | . | . | 130.3 | 3837.2 |
| " 1.694 kg. " " starch | . | . | . | .8 | 757.9 |
| " 28.67 kg. water consumed | . | . | . | ... | 2.1 |
| Total consumption | | | | <u>131.1</u> | <u>4597.2</u> |
| Given out of the body— | | | | | |
| From 3.488 kg. dry matter in dung | . | . | . | 68.9 | 1653.0 |
| " Urine | . | . | . | 54.5 | 203.7 |
| " Gaseous excretions | . | . | . | ... | 2383.1 |
| Total excretion | | | | <u>123.4</u> | <u>4239.8</u> |
| Excess of consumed over excreted— | | | | | |
| Added to the body | . | . | . | <u>7.7</u> | <u>357.4</u> |

We find, then, that in period 1, when the weighing-machine showed that the animal was keeping almost constant in weight, the carbon and nitrogen balance shows that only a quite negligible quantity of nitrogen and a very small quantity of carbon, which can easily be accounted for, were being added to the body. In fact, the body is practically in equilibrium with its food. On the other hand, in period 2 quite considerable quantities of both carbon and nitrogen are being added daily to the body; and this was found to be confirmed by the weighing-machine, which showed an average daily increase of weight of nearly 2 lb. For the sake of further calculation, it is assumed that the nitrogenous matter (protein) of the body contains on the average 16 per cent of nitrogen and 53 per cent of carbon, and that fat contains 76.5 per cent of carbon. It is not, of course, professed that these figures are absolutely correct, but they are as accurate as our present knowledge enables us to make them, and are, at any rate, sufficiently near the truth for our purpose here, which is to show that all the fat which has been formed in the body could not possibly have been derived from the fatty matter and proteids in the food.

Calculation of the Fat formed daily.—We can now use the above figures to calculate how much protein and fat the animal was adding to its body on the average per day during the period it was receiving starch in its food. If protein contains 16 per cent of nitrogen, 48.1 grams of protein would be derived from the 7.7 grams of nitrogen retained in the body. This amount of protein would contain 25.5 grams of carbon, leaving 331.9 grams available for fat formation. From this carbon 434

grams, or nearly a pound, of fat would be derived. If we add to these the moisture which would be contained in any new tissues formed, we get an amount of average increase very closely corresponding with that found from the daily weighings, and we find this increase to consist mainly of fat.

Proof that this Fat cannot all be derived by Voit's Method.—If it is not admitted that fat can be derived from carbohydrates, the fat here formed must have been produced, as Voit and his followers maintained, from fatty matters in the food, and from the decomposition of proteid substances with excretion of the nitrogen in the urine. Ox II. digested during period 2, as a daily average, 77 grams of crude fat. He also digested daily 297.4 grams of crude proteid matter, from which, if we assume that it is all real proteid, and that all the carbon of this proteid goes to form fat, the highest amount of fat which could be formed would be 206 grams. This, added to the 77 grams of crude fat digested from the food, gives 283 grams. But the animal was adding to its body 43.4 grams daily, so that at least 151 grams daily must have been derived from other sources than the proteid matter or fat in the food. Further, what is called "crude fat" is merely the ether extract of the food, and contains various substances which are not really fat, so that 77 grams is too high a figure for the fat which could possibly have been derived directly from the food. Also "crude protein" contains various amide bodies, which are not of the same value as proteids; but even if all the 297.4 grams of crude proteid digested was really proteid, nobody will maintain that its decomposition in the animal body could possibly cause it to yield anything like so much as 206 grams of fat.

Fat must have been derived from Carbohydrates.—What this experiment proved, therefore, was that an amount of fat *much exceeding* 151 grams daily was formed in the body of the animal, and must have derived its carbon from the carbohydrates in the food. In other words, a very large proportion of the fat formed in the body of an ox under these circumstances must have been derived from the carbohydrates in the food. The amount of fat here found to be produced from carbohydrates is so great as to relieve it from any suspicion that it may have been derived from errors of experiment. It is quite outside the limits of experimental error. The case of ox II. has here been used to illustrate the method of proof, because the figures in this case were simpler than some others, and lent themselves in other particulars more readily to the purpose; but in the cases of all the oxen (I.-VI.) precisely similar results were arrived at, and in most cases by experiments stretching over a much greater period of time.

The Second Series of Experiments.—In the second series of

experiments very considerable variations were introduced. The coarse fodder used was a mixture of equal parts of clover-hay and oat-straw. Then for the purpose of enriching the ration not only was wheat-starch used, as in the first series, but also wheat-gluten. This is a richly nitrogenous substance containing in this case over 14 per cent of nitrogen, corresponding to 88 per cent proteid matter. The experiment was divided into four periods. In period 1 a maintenance diet of 19·8 lb. (9 kg.) of the mixed clover-hay and oat-straw was fed daily; in period 2 this was enriched with 4·4 lb. (2 kg.) of starch; in period 3 this was still further enriched by the daily addition of 1·5 lb. (.68 kg.) of gluten; and in period 4 the daily supply of gluten was increased to 3 lb. (1·36 kg.)

The First Experiments confirmed.—The results from periods 1 and 2 exactly confirm those of the first series of experiments in the case of both oxen. In periods 3 and 4 the large addition of proteid matter to the food renders it impossible to demonstrate in the same way that fat must have been derived from carbohydrates. The feeding in these periods, however, in which the nutritive ratio was made comparatively narrow, was designed to bring out other important points.

The Digestion Coefficients.—As in the first series, the addition of starch to the ration had a depressing effect on the digestion of the crude protein, fibre, and fat of the coarse fodder. The starch itself was at the same time almost completely digested. The addition of proteid matter to the ration in the form of gluten distinctly improved the digestion of crude fibre, but had practically no effect on the digestion of nitrogen free extract and of crude fat. At the same time the added proteid was itself almost completely digested. These results agree remarkably well with those previously obtained by Schulze and Maercker¹ in feeding sheep with wheat-gluten.

The Amount of Fat formed.—In all the periods with enriched feeding both the daily weighings and the carbon and nitrogen balance showed that both animals were increasing in weight, but ox III. always made better use of his food than ox IV., and showed both on the balance and in the amount of carbon and nitrogen retained in his system better fattening qualities than his neighbour. As an average for the two animals, however, 221 grams of fat were laid on daily during period 2, when the nutritive ratio was 1:18·19; during period 3, when the nutritive ratio was narrowed to 1:7, 382 grams were laid on daily; while during period 4, when the nutritive ratio had been narrowed to 1:4·5, 526 grams of fat were daily added to the body. It will thus be seen that though, as in the first series,

¹ Journal f. Landw., 6, 1871, p. 68.

considerable quantities of fat are produced with the wide nutritive ratio, this quantity is very largely increased by increasing the quantity of food and at the same time narrowing its nutritive ratio by enriching the ration with gluten. It will be noted that nearly equal increases in the daily production of fat take place for each addition of .68 kg. of gluten to the ration.

Effect of Nitrogenous Food on the Urine.—The enriched nitrogenous diets of periods 3 and 4 caused, of course, a correspondingly increased excretion of urea in the urine; but it was also found that there was an increase in the carbon excreted in the urine far greater than was accounted for by this increase in the urea. In other words, with increased destruction of proteid matter in the body not only is an increased amount of urea excreted, but also a considerably increased amount of non-nitrogenous organic matter—phenol, cresol, &c.—is excreted in the urine. This observation, which confirms results previously obtained by Rubner with dogs,¹ may turn out to be of considerable importance, and lead to results which will throw much light on the progress of the metabolism of proteid matter in the animal body. At any rate it indicates that it is highly improbable that all, or nearly all, the carbon derived from proteid matter broken up in the animal body, and not required for the formation of urea, could possibly be utilised for the formation of fat.

The Third Series of Experiments.—The third series of experiments merely confirms and extends the information gained from the first and second series. As in the first series, the only foods used were meadow-hay and wheat-starch. The chief additional information sought in this set of experiments was an answer to the question, Will an ox continue for any considerable time to lay on fat with a ration the nutritive ratio of which has been made abnormally wide, by the use of food very rich in carbohydrates but very poor in nitrogenous matter and fat?

The Food given.—The oxen, numbers V. and VI., used in this experiment were when bought in very poor condition, so that when put upon a maintenance ration of 19.8 lb. (9 kg.) of meadow-hay they began to increase in weight, and it was some time before they came to even approximate equilibrium with their food. After this first period followed two periods in which the ration was enriched with starch. In period 2 starch was given to the extent of 4.4 lb. (2 kg.) per head daily, and this period was made of considerable length to test whether the gain in fat was capable of lasting with such a ration.

¹ Zeitschrift für Biologie, 21, 1885, pp. 278-280 and 299-304.

The Fat Increase not merely temporary.—It was found that the increase, as shown both on the weighing-machine and by the nitrogen and carbon balance, was just as great at the end of nearly three months of this feeding as at the beginning. Not only so, but in period 3 still more starch was added, and the animals increased in weight and in fat so much the faster. It was at first intended to raise the daily allowance of starch to 8·8 lb. (4 kg.) in this period, but it was soon apparent that this was rather more than the animals could comfortably eat, so only 7·7 lb. (3·5 kg.) was given daily. With this most abnormal ration, with a nutritive ratio of nearly 1:21, the animals continued to gain in fat rapidly, ate their food well, and remained apparently healthy.

The Limit of Proteid Starvation nearly reached.—The limit appeared to be almost reached in this case, however, and it is probable that if this feeding had been continued much longer complications of some kind would have set in. As it was, the urine of one of the animals began to be very abnormal, though the animal itself continued to all appearance in perfect health. It is probable that this was merely the first symptom of deep-seated changes which were setting in on account of the starvation of the system in proteid matter.

Proteid Starvation does not quite prevent Increase in Flesh.—At the same time it is a very notable fact that even in period 3 the nitrogen balance showed that both animals were adding considerably to the nitrogenous matters of their bodies. This is a most remarkable instance of the extent to which a plentiful supply of non-nitrogenous substances in the food can protect proteid matter from destruction. In this case the amount of proteid digested daily seemed hardly sufficient, according to the generally accepted views, to counterbalance the necessary daily destruction of nitrogenous matter in the metabolism of the system; yet, in the presence of a plentiful supply of non-nitrogenous nutrients, a very considerable proportion of it was daily added to the body, so that we have a considerable increase not only in the fat, but even in the nitrogenous matters of the body.

It is then apparent that the so-called circulatory proteid of an animal enjoying almost complete stall rest can be kept in a state of great poverty for, at any rate, a considerable time without serious consequences ensuing, and that if it be sufficiently protected by a plentiful supply of carbohydrates, the animal may even gain somewhat in flesh and gain very much in fat. Under any ordinary conditions of farm practice rations so poor in proteid as those in period 3 could not occur. Even if animals were fed entirely on potatoes the nutritive ratio would be narrower than the very wide ones here artificially produced.

The Fourth Series of Experiments.—The fourth series of experiments, undertaken in the years 1889-90 with oxen XX. and XXI., is of comparatively little importance. The main question was already settled in the preceding series, and these investigations were undertaken principally to throw light on some of the subsidiary points which had been raised in so lengthened a series of researches. In this series only narrow nutritive ratios were used, and no further proof was sought that fat was formed from carbohydrates. Rations containing much easily digested proteid matter as well as carbohydrate were designed, so as to try if animals so fed would lay on fat and flesh much faster than those fed on the rations of former experiments which were so abnormally poor in proteid.

Flesh-Meal as Food.—For this purpose flesh-meal was used as a suitable food. The animals were fed first on a maintenance ration of hay, which gave a nutritive ratio of 1 : 9. Then 2·2 lb. (1 kg.) of flesh-meal was added to their daily allowance of hay. This flesh-meal had been almost completely freed from fat by extraction with ether, and contained over 97 per cent of proteid matter, and less than one-quarter of 1 per cent of fat. The addition of this to the hay made the nutritive ratio 1 : 3·6. The proteid matter of the flesh-meal was very completely digested, but the rate of increase of the animals in flesh was not notably greater than in former researches. The great part of the nitrogen of this extra proteid digested was simply excreted in the urine. As was noticed in the second series of experiments, this increase of nitrogen in the urine was accompanied by a considerable increase in its non-nitrogenous organic matters.

There was also a third period in these experiments in which 4·4 lb. (2 kg.) of wheat-starch was added to the ration of the second period. This made the nutritive ratio 1 : 5·1. With this feeding a very considerable increase both of flesh and of fat was obtained, but not greater than that obtained with much more abnormal rations. In all other points the result of this series of researches simply confirmed those of series II.

When the oxen used in this series were slaughtered it was found that XXI. was tuberculous, but as the results obtained with him agree, so far as they go, with those of XX., they were not entirely neglected.

SUMMARY OF THE RESULTS.

In the experiments briefly described above we have a mass of information obtained under circumstances which should give us the greatest confidence in its accuracy. Ingenuity can hardly suggest anything further which could have been done to stop every loophole by which error might enter. The experiments

were not on only one, but on a considerable number of animals, and were undertaken with a variety of diets whose nutritive materials varied enormously. Each animal was kept under experiment not for a few days only, as has sometimes been the case in difficult experiments of this kind, but for many months. The results are perfectly concordant with one another in nearly every detail. It must then be admitted that however we may proceed to interpret the results obtained, the accuracy of the results themselves is hardly open to question.

Ruminants can derive Fat from Carbohydrates.—We have a most decided answer to the main question which Professor Kuhn set out to solve. It will be impossible in future to maintain that ruminants must obtain that part of their fat which is not derived from fat previously present in their food, from proteid matter which is decomposed in the body with excretion of its nitrogen through the urine. It has been shown over and over again, and in the case of six different oxen, that even when the most liberal concessions are made in favour of the proteid origin of fat it is impossible that all, or nearly all, the carbon contained in the fat formed by these animals could have been derived from proteid broken up in their bodies. On the other hand, there is nothing here to show that some fat may not be derived from proteid. The result of other experiments make it highly probable that fat can be so derived. But it has been clearly shown that fat can also be derived from carbohydrates, and that under the conditions which obtained in these experiments, a large part of the fat formed must have derived its carbon from the carbohydrates in the food.

The Functions of Nitrogenous and Non-nitrogenous Nutrients.—Much prejudice has been done to the advance of a clear knowledge of the action of food materials in the nutrition of the body, and to the impartial consideration and investigation of many questions in animal nutrition by the tendency of so many physiologists in the past to tie down nitrogenous and non-nitrogenous nutrients respectively, to certain definite and sharply-opposed functions. From the time of Liebig to the present day we have found it hard to get beyond the idea that the proteid matters of food, the so-called flesh-formers, build up the body, while the fats and carbohydrates, the so-called heat-givers, are burned in the body as fuel to supply heat and force. This idea is true to a certain extent, and there must always be a certain essential distinction in function between the nitrogenous and the non-nitrogenous organic constituents of food. The living organism can never build up its nitrogenous living protoplasm from fats and carbohydrates alone.

Still we must not be bound down for ever to what were at best imperfect ideas, derived from very limited knowledge.

The living protoplasm is not the same as the proteid on which it feeds. It is a much more complex substance, mobile and constantly changing, which receives into itself, and as part of its unstable self, the nutrients of the food, whether nitrogenous or non-nitrogenous; and the further changes which take place, and which build up the substance of the body, or produce its heat and force, are changes depending on the unstable and ever-changing nature of the living molecule, and take place in the living substance itself. This view of the nature of nutrition is much more completely in accordance with such facts as have been brought out in these experiments than the older view. According to this view the formation of fat does not take place from proteids or from carbohydrates, or even from fats themselves present in the food, but from the living plasm which these go to nourish. We know that the fats formed in the animal body are often very different from the fats which the animal received in its food. Proteids or fats or carbohydrates may furnish the material to make fat, but only by themselves first ceasing to be proteid, fat, or carbohydrate, and becoming an integral part of the complex living substance from which the fat is afterwards split off.

Fat Formation depends on the quantity of Food digested.—Thus we find that in summarising the whole of these series of experiments, the amount of fat formed does not depend merely on the amount of proteid digested, nor yet merely on the amount of carbohydrate digested, but rather on the total amount of organic matter digested. So soon as we have an excess of food over that required to maintain the animal, a part of that is capable of being utilised for fat formation; and it seems to matter very little, so far as that fat formation is concerned, whether the excess of food is proteid or carbohydrate. This is illustrated in Table III., which is formed by arranging in order, according to the amount of organic matter digested daily per 1000 lb. live-weight, all the experiments on oxen I. to VI. in which they received more than a maintenance ration. The weights given are calculated from the weight of the animal at the beginning of each experiment.

Remarks on Table III.—It is here seen that, with one or two such slight exceptions as are to be expected, the daily amount of fat formed increases in proportion to the daily amount of organic matter digested, and seems to bear no relation at all to the nutritive ratio of the food. The greatest amounts of fat formed—Nos. 13 and 14—are produced by rations having the most widely different nutritive ratios. These two nutritive ratios are the extremes of the whole series; but they come together, because with them the animals were getting the heaviest feeding, and though in one case that feeding was

largely made up of gluten and in the other of starch, both result in rapid fat formation.

TABLE III.

DEPENDENCE OF FAT FORMATION ON ORGANIC MATTER DIGESTED.

Per Day, and 1000 lb. Weight at start of Experiment.

| No | Experiment | | Organic matter digested | Nutritive ratio | Fat formed |
|---------------|------------|---------|-------------------------|-----------------|------------|
| | On | Period. | | | |
| | | | lb | | lb. |
| 1 | IV. | 2 | 8.72 | 1:18.3 | 0.255 |
| 2 | III. | 2 | 8.95 | 1:19.1 | 0.446 |
| 3 | VI. | 2 (a) | 9.12 | 1:14.5 | 0.473 |
| 4 | I. | 2 (b) | 9.35 | 1:15.2 | 0.464 |
| 5 | VI. | 2 (b) | 9.36 | 1:14.0 | 0.592 |
| 6 | I. | 2 (a) | 9.47 | 1:14.9 | 0.591 |
| 7 | V. | 2 (a) | 9.54 | 1:12.9 | 0.658 |
| 8 | V. | 2 (b) | 9.60 | 1:14.0 | 0.676 |
| 9 | III. | 3 | 9.97 | 1: 7.2 | 0.596 |
| 10 | II. | 2 | 10.06 | 1:15.6 | 0.678 |
| 11 | IV. | 3 | 10.09 | 1: 7.1 | 0.618 |
| 12 | VI. | 3 | 10.85 | 1:17.4 | 0.799 |
| 13 | III. | 4 | 10.98 | 1: 4.5 | 0.835 |
| 14 | V. | 3 | 11.18 | 1:20.9 | 1.168 |
| Mean Nos. 1-5 | | | 9.10 | ... | 0.446 |
| " 6-10 | | | 9.73 | ... | 0.640 |
| " 11-14 | | | 10.78 | ... | 0.852 |

One lb. of Starch causes formation of .2 lb. of Fat.—A close examination of the figures of all the experiments reveals the fact that in the average 1 lb. of starch added in excess of what was required for maintenance gave rise to the formation of about .2 lb. of fat. In other words, it required about 5 lb. of starch to be fed to the animal, over and above a maintenance diet, to lead to the formation of 1 lb. of fat. Of course these figures cannot be insisted upon very strongly except as the merest approximation, as they might be greatly modified in different circumstances, and with a different breed of animals.

A Tabular Summary.—In Table IV. is given a summary of the whole of the experiments, showing the amount of proteid matter and nitrogen free nutrients digested in the mean day during each period, the nutritive ratio of the food, and the amounts of proteid matter and fat added to the body in the mean during each day—all calculated per 1000 lb. live-weight. The 1000 lb. live-weight is, as before, calculated from the weight at the beginning of each period.

TABLE IV.

| Ox. | Food per head per day. | Period. | Mean live-weight during period. | PER DAY, AND 1000 LB. LIVE-WEIGHT. | | | | | | | Addition to body. | |
|------|--|---------|---------------------------------|------------------------------------|--------|--------|------------------|---------|-----|-------|-------------------|-----|
| | | | | Digested nutrients. | | | Nutritive value. | Proteid | | Fat. | | |
| | | | | Non-nitrogenous matter. | | | | | | | | |
| | | | | Proteid. | lb. | lb. | Total. | lb. | lb. | lb. | lb. | lb. |
| I. | Hay, 22 lb.; starch, 4.4 lb. | 2 (a) | 1611 | 0.597 | 8.878 | 9.475 | 1 : 14.9 | 0.010 | lb. | 0.591 | | |
| " | " " " | 2 (b) | 1701 | 0.577 | 8.773 | 9.350 | 1 : 15.2 | 0.038 | | 0.464 | | |
| II. | Hay, 20.9 lb.; starch, 4.4 lb. | 2 | 1438 | 0.607 | 9.455 | 10.062 | 1 : 15.6 | 0.075 | | 0.678 | | |
| III. | Clover-hay, 9.9 lb.; oat-straw, 9.9 lb.; starch, 4.4 lb. | 2 | 1428 | 0.445 | 8.509 | 8.954 | 1 : 19.1 | 0.097 | | 0.446 | | |
| " | As above, + 1.5 lb. gluten | 3 | 1483 | 1.220 | 8.752 | 9.972 | 1 : 7.2 | 0.141 | | 0.596 | | |
| " | " + 3 lb. gluten | 4 | 1530 | 2.009 | 8.971 | 10.980 | 1 : 4.5 | 0.081 | | 0.835 | | |
| IV. | Clover-hay, 9.9 lb.; oat-straw, 9.9 lb.; starch, 4.4 lb. | 2 | 1388 | 0.452 | 8.268 | 8.720 | 1 : 18.3 | 0.067 | | 0.255 | | |
| " | As above, + 1.5 lb. gluten | 3 | 1391 | 1.244 | 8.843 | 10.087 | 1 : 7.1 | 0.089 | | 0.618 | | |
| V. | Hay, 19.8 lb.; starch, 4.4 lb. | 2 (a) | 1364 | 0.684 | 8.854 | 9.538 | 1 : 12.9 | 0.145 | | 0.658 | | |
| " | " " " | 2 (b) | 1408 | 0.639 | 8.965 | 9.604 | 1 : 14.0 | 0.042 | | 0.676 | | |
| " | " " " | 3 | 1463 | 0.512 | 10.671 | 11.183 | 1 : 20.9 | 0.112 | | 1.168 | | |
| VI. | " " " | 2 (a) | 1450 | 0.588 | 8.528 | 9.116 | 1 : 14.5 | 0.110 | | 0.473 | | |
| " | " " " | 2 (b) | 1485 | 0.624 | 8.732 | 9.356 | 1 : 14.0 | 0.120 | | 0.593 | | |
| " | " " " | 3 | 1520 | 0.591 | 10.264 | 10.855 | 1 : 17.4 | 0.160 | | 0.789 | | |
| XX. | Hay, 22 lb.; flesh-meal, 2.2 lb. | 2 (a) | 1513 | 1.971 | 7.170 | 9.142 | 1 : 3.6 | 0.191 | | 0.167 | | |
| " | " " " | 2 (b) | 1525 | 1.976 | 7.332 | 9.308 | 1 : 3.7 | 0.110 | | 0.191 | | |
| " | " " starch, 4.4 lb. | 3 | 1551 | 1.928 | 9.815 | 11.743 | 1 : 5.1 | 0.173 | | 0.450 | | |

Comparison of Nitrogen rich and Nitrogen poor Diets.—If, now, from all these we pick out the six cases in which rations rich in proteids were given, and which had therefore narrow nutritive ratios, and set opposite to them the six cases which most nearly correspond to them, experiment for experiment, in the total quantity of nutrients digested, but in which rations poor in proteids, and which had therefore wide nutritive ratios, were given, we can make an interesting comparison. This is done in Table V.

TABLE V.—PER DAY, AND 1000 LB. LIVE-WEIGHT.

| RATIONS RICH IN PROTEIDS. | | | | |
|---------------------------|------------------|--------------------------|----------------|----------|
| Ox. | Nutritive ratio. | Organic matter digested. | Added to body. | |
| | | | Fat. | Proteid. |
| | | lb. | lb. | lb. |
| XX. | 1:5.1 | 11.74 | 0.450 | 0.173 |
| III. | 1:4.5 | 10.98 | 0.835 | 0.081 |
| IV. | 1:7.1 | 10.09 | 0.618 | 0.089 |
| III. | 1:7.2 | 9.97 | 0.596 | 0.141 |
| XX. | 1:3.7 | 9.31 | 0.191 | 0.110 |
| XX. | 1:3.6 | 9.14 | 0.167 | 0.191 |
| Mean | 1:5.2 | 10.21 | 0.476 | 0.131 |
| RATIONS POOR IN PROTEIDS | | | | |
| Ox. | Nutritive ratio. | Organic matter digested | Added to body | |
| | | | Fat. | Proteid |
| | | lb. | lb. | lb. |
| V. | 1:20.9 | 11.18 | 1.168 | 0.112 |
| VI. | 1:17.4 | 10.86 | 0.784 | 0.160 |
| II. | 1:15.6 | 10.06 | 0.678 | 0.075 |
| V. | 1:14.0 | 9.60 | 0.676 | 0.042 |
| I. | 1:14.9 | 9.48 | 0.591 | 0.010 |
| VI. | 1:14.5 | 9.12 | 0.473 | 0.110 |
| Mean | 1:16.2 | 10.05 | 0.728 | 0.085 |

Mean Result.—It is the mean result of these two sets of experiments that is most instructive. In each set the mean amount of food digested per day and 1000 lb. live-weight is about

10 lb. The advantage in weight of food digested is slightly on the side of the rations rich in proteids. Yet the rations poor in proteids but rich in carbohydrates give a considerably greater mean increase of fat in the body. At the same time they do not give so good an increase of proteid matter. So it would seem that though, generally speaking, fat formation merely depends on the excess of matter digested over the amount required for maintenance, still a ration rich in proteids forms rather less fat, but forms more flesh, than one giving the same weight of digested materials but rich in carbohydrates.

The Feeding not heavy for fattening Animals.—It is to be noted that none of these rations can be considered heavy feeding. The animals were supplied not only with very abnormal rations, but with comparatively small amounts of food for fattening animals. According to Continental feeding standards, a fattening animal should digest daily about 18 lb. of food per 1000 lb. live-weight, and this digested matter should contain about 2.5 lb. of proteids, 15 lb. of carbohydrates, and .5 lb. of fat. But the heaviest feeding in these experiments did not amount to 12 lb. of digested organic food per 1000 lb. live-weight, and supplied less than 2 lb. of proteids, and less than 10 lb. of carbohydrates. Still more remarkable is the ration supplying the second greatest amount of digested food. The animal, ox V., was digesting from his food daily per 1000 lb. live-weight only about half a pound of proteid matter. Yet in both these cases the animals were gaining weight moderately rapidly, as indicated not only by the carbon and nitrogen balance, but by the daily use of the weighbridge.

Maintenance Rations.—The results obtained from the first period of each series of experiments give us some valuable information as to what forms a maintenance ration for oxen, enjoying nearly complete quiet in stalls kept at a moderate, equable temperature. Table VI. gives a summary of these results.

The conclusion can be drawn from the above figures that oxen I., II., III., and IV., though nearly in equilibrium with their food, were losing weight slightly, while oxen V., VI., and XX. were gaining a little in weight. The daily weighings show the same thing. This preliminary feeding lasted in no case less than 85 days, and in one case was as long as 172 days. During this time the weighbridge showed, as one might expect, that the animal was sometimes losing a little and sometimes gaining a little; but when we take the result for the whole period, oxen I., II., III., and IV. had lost a few pounds, while the others had gained a few pounds in weight. The cases of V. and VI. are easily explained. They were in very poor condition when bought, and therefore easily gained flesh even on a poor diet.

TABLE VI.—MAINTENANCE RATIOMS FOR OXEN. PER DAY, AND 1000 LB. LIVE-WEIGHT.

| Ox. | | Digested nutrients. | | | Nutritive ratio. | Increase (+) or loss (-) of the body. | |
|---------|--------------------------|---------------------|-----------------------------------|--------------|------------------|---------------------------------------|------------|
| | | Crude proteins. | Non-nitro- genous nutrient. | Total. | | Proteid. | Fat. |
| | | | | | | | |
| I. | Meadow-hay | lb. 0.593 | lb. 6.643 | lb. 7.236 | 1: 11.2 | lb -0.054 | lb. ... |
| II. | " | 0.653 | 7.223 | 7.878 | 1: 11.1 | +0.001 | +0.141 |
| | Mean | 0.623 | 6.933 | 7.557 | 1: 11.2 | -0.027 | ... |
| III. | Clover-hay and oat-straw | 0.535 | 6.420 | 6.955 | 1: 12.0 | -0.026 | +0.102 |
| IV. (a) | | 0.537 | 6.468 | 7.005 | 1: 12.0 | -0.005 | +0.179 |
| " (b) | | 0.514 | 6.207 | 6.721 | 1: 12.0 | -0.037 | -0.131 |
| Mean | | 0.529 | 6.365 | 6.894 | 1: 12.0 | -0.029 | +0.050 |
| V. | Meadow-hay | 0.749 | 6.619 | 7.368 | 1: 8.8 | +0.088 | +0.206 |
| VI. | " | 0.711 | 6.486 | 7.197 | 1: 9.1 | +0.061 | +0.238 |
| | Mean | 0.730 | 6.553 | 7.283 | 1: 9.0 | +0.075 | +0.222 |
| XX. | Meadow-hay | 0.804 | 7.267 | 8.071 | 1: 9.0 | +0.031 | +0.132 |

With ox XX., again, the hay used was of better quality than that used with any of the others, and was therefore better digested.

Outward Equilibrium and real Equilibrium with a Ration.—It is probable that it is only those animals which are shown to be gaining a little in weight which are in real equilibrium with their food. The hair, horn, hoof, &c., go on forming all the time, and increasing in weight. But these can hardly be considered part of the effective working organism which we are trying to keep in equilibrium. If the animal is not increasing in weight, these external appendages are gaining at the expense of the internal animal, and there is no real equilibrium. It would seem, then, that oxen I. to IV. were not receiving quite enough food to really just maintain their condition.

Continental and American Standard of Maintenance.—Making allowance for this, we find that these experiments agree pretty well with the generally received Continental and American standard of maintenance for oxen enjoying complete stall rest. This standard allows the animals 7 lb. of digested proteids, and 8 lb. of digested carbohydrates per 1000 lb. live-weight, and has a nutritive ratio of about 1 : 12. These experiments give a maintenance ration somewhat lower than this, especially in carbohydrates; but it must be remembered that the temperature was kept equable by means of gas-stoves, and hence the animals would consume rather less material to keep up the body heat than under ordinary conditions.

THE VALUE OF CELLULOSE IN FOOD.

In so lengthened and thorough a series of researches many other important questions were studied besides the main problem for the solution of which the work was undertaken. These we cannot do more than just mention here. Many animals, and especially ruminants, digest a great deal of the cellulose of their food. It has always been held that, weight for weight, this cellulose is not so valuable as the other carbohydrates digested.

The Excretion of gaseous Hydrocarbons not due to Cellulose alone.—It is known that herbivorous animals excrete a great deal of a mixture of hydrocarbons, of which marsh-gas is probably the chief, in the gases which escape from the alimentary system. It has been supposed that these hydrocarbons were formed from the cellulose during the changes which preceded its digestion, and that therefore all the carbon lost in hydrocarbons escaping from the body was to be deducted from that cellulose reckoned as digested. Now Kuhn shows in these experiments that this excretion of hydrocarbons is no small

thing. As the average of all the experiments, about 8 per cent of the total carbon excreted from all sources in gaseous form is excreted in hydrocarbons. If all this loss of carbon is to fall on cellulose, it would most seriously diminish the value we should have to ascribe to it in food. But by a most ingeniously worked-out series of observations Kuhn produces powerful evidence that this loss should fall on all the carbohydrates pretty equally. He brings forward facts and figures strongly supporting the view that starch loses almost if not quite as great a percentage of its carbon in the form of gaseous hydrocarbons during its digestion as cellulose. In other words, this loss of carbonaceous matter from that which is usually represented as digested should fall not entirely on the cellulose, but probably on other carbohydrates as well.

Cellulose and Hippuric Acid Excretion.—On the other hand, Professor Kuhn traces a connection between cellulose digestion and the excretion of hippuric acid in the urine. All herbivorous, and therefore cellulose-digesting, animals excrete considerable quantities of hippuric acid in their urine. From calculations based on the analyses of the urine of all the animals used for these experiments, a connection is traced between the amount of hippuric acid excreted and the amount of cellulose digested. What the meaning of this relationship may be has yet to be discovered.

In conclusion, it should be remembered that these experiments were not undertaken, like most experiments in this country, with any direct utilitarian object in view. They were State-supported experiments, undertaken simply to increase knowledge, quite apart from the applications which that knowledge may afterwards receive. We are often unable at first to interpret and apply our knowledge till further developments have shown us all its bearings. But the knowledge is not, therefore, less valuable. Whatever increases our knowledge increases our power and authority over nature, and the practical value of all true scientific knowledge will slowly and surely, but often in most unexpected directions, unfold itself.

BORDEAUX SPRAY AS A PREVENTIVE OF POTATO DISEASE.

By Dr A. P. AITKEN, Chemist to the Society.

IN 1891 an extensive series of experiments was carried out by the Highland and Agricultural Society in Scotland, and by the Royal Agricultural Society in England, to test the value of the Bordeaux spray as a preventive of potato disease. The results were far from uniform. In Scotland and in some parts of England the treatment entirely failed to diminish the disease; but in other parts of England, and also in Ireland and in France, where many experiments had been made, it was attended with considerable, and sometimes with very marked, success.

These experiments were made with the "Éclair" hand-spraying apparatus, by the use of which a man can spray satisfactorily from a fourth to half an acre per day. The uncertainty of the treatment and the trouble and cost of it were such as to prevent its coming into general use in Scotland, and little has been heard of it in this country since the date of these experiments.

Two circumstances occurred to cause the Directors of the Society to institute another series of experiments last year—the annual Show was to be held at Dumfries, where early potatoes are grown upon a large scale, notably on the farm of Terreglestown, on which the Show was to be held; and the introduction of the strawsoniser gave promise of expeditiously applying the spray over a large area. The Committee appointed to see the experiment carried out were the Rev. John Gillespie (Convener), Mr Matthew G. Wallace, Terreglestown, the Society's Chemist, and the Society's Botanist. Mr Strawson was kind enough to supply a strawsoniser for the occasion; and Mr Carruthers, druggist, Dumfries, procured the materials for making the *bouillie bordelaise*, and superintended its preparation on the three occasions when it was required.

The experiment was made upon a 4½-acre field adjoining the showyard, and planted with Sutton's Early Regents.

Owing to the long-continued drought the plants were late in coming, and the first application of spray was not made until the 3d July, when the drills had been moulded up and the shaws were about 10 inches high.

There were in all seven plots, consisting each of four drills 300 yards long, and separated from each other by ten drills which were not sprayed. The spray was applied on three

occasions. The first occasion is marked No. 1, the second No. 2, and the third No. 3, on the annexed diagram. The plots sprayed

| | <i>a</i> | <i>b</i> | <i>c</i> | <i>d</i> | <i>e</i> | <i>f</i> | <i>g</i> |
|--------|----------|----------|----------|----------|----------|----------|----------|
| July 3 | 1 | 1 | 1 | | | | |
| " 27 | | 2 | 2 | 2 | 2 | | 2 |
| Aug. 6 | | | 3 | 3 | | 3 | 3 |

on the first occasion were plots *a*, *b*, and *c*; on the second occasion, plots *b*, *c*, *d*, *e*, and *g*; and on the third, plots *c*, *d*, *f*, and *g*.

The object of this arrangement was to see whether one, two, or three sprayings succeeded best, and to see whether the later or earlier sprayings were better. The Society's experiment comprised only the plots from *a* to *f*, but a seventh—viz., plot *g*—was added at the request of Mr Strawson, in order to test the efficacy of his own mixture.

The mixture applied to all but plot *g*, was the same as that used in 1891—viz., per acre—

| | | | | | |
|---------------------------|---|---|---|---|-------------|
| Sulphate of copper (pure) | . | . | . | . | 20 lb. |
| Lime | . | . | . | . | 10 lb. |
| Water | . | . | . | . | 80 gallons. |

The strawsoniser supplied was provided with seven nozzles capable of spraying seven drills at once—viz., six in the middle and two drills half done at each side. In these experiments only five nozzles were working, the two extreme ones having been turned off. It must be said for the strawsoniser that it accomplishes the spraying process remarkably well. The nozzles are so arranged that they can be adjusted to any convenient height, so that the spray may be directed either over the plants or under them. In this case the nozzles were lowered nearly to the ground, and the spray was directed upwards, so that the under side of the leaves, where the disease is said to have its origin, might be as thoroughly wetted as possible. That the leaves cannot be thoroughly wetted is evident, and mainly for the reason that they protect each other even in the young state, but especially when the plants are well grown.

The success of the experiment depended in the first place upon the occurrence of disease, and it was a fortunate circum-

stance, at least as regards the experiment, that the disease did make its appearance, and still more fortunate for Mr Wallace that its depredations were comparatively slight.

It was well on in September before the crop was ripe and ready for lifting. In ordinary seasons it would have been lifted six weeks earlier, but in 1895 the season was quite abnormal. From 29th April till 13th July not a drop of rain fell in the district, and the growth was exceedingly slow. The progress was still further retarded by the occurrence of a sharp frost on 13th June, which cut the young plants quite down. The disease began to make its appearance about the beginning of the second week of August. The weather then was wet and favourable to the spread of the disease, and on the 12th August a thunderstorm occurred, with a deluge of rain which completely broke down the crop. Sunshine thereafter soon dried up and blackened the broken plants. The only parts in all the field that retained their vitality and remained green were the plots which had been sprayed, and particularly those which had been sprayed on 27th July. About ten days later they also succumbed.

The lifting took place on 26th and 27th September in fine dry weather, under the superintendence of Mr Wallace and myself. The whole area under experiment covered about six acres, but as the growth over the whole was very uniform, a section of about two acres was selected as representative of the rest, and only the four central drills of each of the thirteen plots were selected for weighing. In order to expedite matters and prevent any mistake the whole field, with the exception of the drills to be weighed, was cleared off before the lifting and weighing began. Each plot of four drills, each 100 yards long, representing one-sixteenth of an acre, was bagged and weighed on the field and carted off and pitted separately.

The results are shown in the adjoining table (p. 255).

As the lifting and weighing proceeded it was noticed that the crop diminished plot by plot in going from *a* to *f*. Had there been no blank plots intervening, this diminution might have been erroneously attributed to the effects of the spray; but, fortunately, between each pair of sprayed plots a wide unsprayed plot intervened, and the weight of the crop on the unsprayed section served to show how far the diminution of the crop was directly traceable to an alteration in the character of the land. The field sloped gently upwards from *a* to *f*, a distance of about 70 yards, and the soil became lighter and more gravelly as it ascended. The difference was not very great, and in an ordinary season it would not have caused any perceptible difference in the weight of the crop, but the exceptionally dry spring of 1895 caused the plants on the higher

ground to suffer more from drought than those lower down. It will be noticed that the effect of the drought was to diminish the quantity of the large potatoes, but to increase the quantity of the small ones as the soil became lighter.

EXPERIMENT WITH BORDEAUX SPRAY ON POTATOES.
TERREGLESTOWN FARM, 1895.

| Plots, are cwt | Dates of spraying | LARGE POTATOES | | | | | | SMALL POTATOES | | | | | |
|-------------------|----------------------------|----------------|-----|----|----------|-----|----|----------------|-----|----|----------|-----|----|
| | | Sound | | | Diseased | | | Sound | | | Diseased | | |
| | | cwt | qr | lb | cwt | qr | lb | cwt | qr | lb | cwt | qr | lb |
| a | July 3 | 10 | 3 | 1 | 1 | 2 | 5 | 4 | 0 | 0 | 0 | 2 | 0 |
| b | " 3, July 27 | 10 | 1 | 14 | 0 | 2 | 4 | 4 | 2 | 11 | 0 | 1 | 1 |
| c | " 3, " 27, Aug 6 | 10 | 0 | 21 | 0 | 2 | 13 | 4 | 3 | 10 | 0 | 1 | 4 |
| d | " 27, Aug. 6 | 10 | 3 | 7 | 1 | 0 | 4 | 4 | 3 | 19 | 0 | 1 | 16 |
| e | " 27 | 9 | 0 | 24 | 0 | 2 | 6 | 4 | 2 | 21 | 0 | 1 | 1 |
| f | Aug. 6 | 7 | 2 | 10 | 0 | 3 | 8 | 5 | 0 | 16 | 0 | 2 | 6 |
| | Total | 58 | 3 | 21 | 5 | 0 | 12 | 28 | 0 | 21 | 2 | 1 | 0 |
| | Average per acre | tons | cwt | qr | tons | cwt | qr | tons | cwt | qr | tons | cwt | qr |
| | | 7 | 17 | 3 | 0 | 13 | 3 | 3 | 15 | 0 | 0 | 6 | 0 |
| | | cwt | qr | lb | cwt | qr | lb | cwt | qr | lb | cwt | qr | lb |
| a | Unsprayed | 10 | 0 | 25 | 1 | 0 | 0 | 4 | 0 | 22 | 0 | 1 | 16 |
| b | " | 9 | 2 | 24 | 0 | 2 | 26 | 3 | 3 | 18 | 0 | 1 | 5 |
| c | " | 9 | 3 | 10 | 1 | 0 | 17 | 4 | 0 | 13 | 0 | 1 | 14 |
| d | " | 8 | 3 | 5 | 0 | 3 | 2 | 4 | 1 | 4 | 0 | 2 | 4 |
| e | " | 7 | 3 | 26 | 1 | 0 | 15 | 4 | 3 | 7 | 0 | 2 | 2 |
| f | " | 6 | 3 | 11 | 0 | 1 | 14 | 5 | 2 | 10 | 0 | 1 | 11 |
| | Total | 53 | 1 | 17 | 5 | 0 | 18 | 26 | 3 | 18 | 2 | 1 | 24 |
| | Average per acre | tons | cwt | qr | tons | cwt | qr | tons | cwt | qr | tons | cwt | qr |
| | | 7 | 3 | 0 | 0 | 13 | 3 | 3 | 11 | 0 | 0 | 6 | 2 |

In comparing the figures given in the upper half of the table, we must view them in relation to the corresponding unsprayed plots in the lower half, so as to get an approximately correct estimate of the advantage accruing from the use of the spray. A still more accurate way of arriving at that result is to find what would have been the amount of crop which each of the sprayed plots would have yielded if it had been left unsprayed, and to compare that amount with the actual crop. What that amount is can be easily calculated. It will evidently be the average of those of the two unsprayed plots on either side of it.

In making such a calculation we must consider the whole produce of the plot, large and small, diseased and sound together. That has been done in the following table:—

| | | | | | Total produce of sprayed plots. | | | | Calculated normal produce. | | | |
|----------|---|---|---|---|------------------------------------|-----|-----|--|-------------------------------|-----|-----|--|
| | | | | | cwt. | qr. | lb. | | cwt. | qr. | lb. | |
| <i>a</i> | . | . | . | . | 16 | 3 | 6 | | .. | | | |
| <i>b</i> | . | . | . | . | 15 | 3 | 2 | | 15 | 0 | 26 | |
| <i>c</i> | . | . | . | . | 15 | 3 | 20 | | 15 | 0 | 22 | |
| <i>d</i> | . | . | . | . | 17 | 0 | 18 | | 14 | 3 | 20 | |
| <i>e</i> | . | . | . | . | 14 | 2 | 24 | | 14 | 1 | 19 | |
| <i>f</i> | . | . | . | . | 14 | 0 | 12 | | 13 | 3 | 6 | |

It is evident from these figures that the effect of spraying the plants has been to increase the total yield of potatoes in every instance. Whether this result is to be attributed to the effect of the spray upon the leaves themselves, whereby they were stimulated to greater activity, or whether it is to be attributed to a manurial effect of the spray upon the soil, it is impossible to say. There is no doubt that a very considerable amount of the spray fell upon the soil, and it may be that sulphate of copper—the blue vitriol—has a manurial effect comparable with that of sulphate of iron—the green vitriol. It is difficult to imagine that the spraying of the leaves themselves could be beneficial to them in increasing their power of assimilation, for the solid hydrate or basic sulphate of copper which coats the leaves after the water of the spray has evaporated will have a mechanical effect similar to that of dust. It will clog the stomata, and the effect of that should be to diminish assimilation. It is probable that there is something in the action of the copper compound apart altogether from its corrosive action on the spores of the *peronospora*, which deserves the attention of vegetable physiologists.

Another remarkable peculiarity brought out by these experiments, is that the increase of crop is almost entirely confined to the large sound potatoes.

The total amount of diseased potatoes grown on the sprayed section was practically the same as that grown on the unsprayed section, both as regards large and small potatoes. It must be said, however, that the incidence of disease on both sections was very erratic, and seemed to have no reference to the amount of spraying they had received on the sprayed section, nor to the position of the plots upon the unsprayed section. So far as the large potatoes were concerned, in the unsprayed section the weight of diseased tubers was alternately large and small with curious regularity. It is conceivable that some drills may have been a little deeper planted, or perhaps moulded up a little higher, than others, whereby the tubers were less easily reached by spores falling from the leaves and descending through the

soil; and the fact that the smaller potatoes were not similarly affected might be explained by their lying deeper than the larger ones. Whatever may be the reason, the occurrence of such fluctuations causes me to doubt whether the application of the spray has had any effect whatever in diminishing the incidence of the disease.

That the spray has increased the amount of crop is evident. It certainly kept the plants longer green, and by so doing lengthened their period of assimilation. If that were the sole cause of the increase, it might be regarded as advantageous in the case of late potatoes, but not in the case of early ones. It deserves to be noted, however, that plot *c*, which received the greatest amount of spray, did not produce the greatest amount of crop.

It remains to notice the crop on plot *g*, which was sprayed with Strawson's ready-made mixture, which needs nothing but the addition of water to make it ready for use. The results are—

| | | | | | cwt. | qr. | lb. |
|-------|------------|---|---|---|------|-----|-----|
| Large | { Sound . | . | . | . | 7 | 2 | 24 |
| | { Diseased | . | . | . | 0 | 1 | 18 |
| Small | { Sound . | . | . | . | 5 | 1 | 13 |
| | { Diseased | . | . | . | 0 | 0 | 24 |
| Total | | | | | 13 | 2 | 23 |

These results compare favourably with those of the neighbouring plots, but the difference is not of any importance; and though there is less disease on this than on the neighbouring unsprayed plot *f*, the difference is not great, and is probably quite accidental.

The potatoes were all pitted in the same pit, with bundles of straw between the lots. Mr Wallace informs me that on comparing the lots when the pit was opened four months afterwards there was no perceptible difference among them.

The conclusion of the whole experiment is, that the application of the spray had the effect of increasing the amount of sound large potatoes about one-tenth or so, but it had no appreciable effect in diminishing the incidence of the disease. In this particular instance the increase of the crop was not so considerable as to repay the cost of the application of the spray.

Mr A. N. M'Alpine, Botanist to the Society, adds the following notes: "I made two visits to the potato-disease experiments, and took two sets of samples—(1) when the shaws had fallen, and (2) when the potatoes were being lifted. My object was to find how the potato-disease fungus behaved on the sprayed and unsprayed plots respectively. Pieces of shaw taken close to the ground gave cultures of the fungus, and there

was no perceptible difference of behaviour between the shaws from sprayed and unsprayed drills. Evidently the fungus was making, or had already made, its way to the tubers along and through the shaws. Examination of the visibly diseased potatoes at time of lifting showed that the spores of the fungus had fallen on the tubers, germinated there, and produced the visible disease. The potato-disease fungus accordingly gets at the tubers in two ways—(1) through the shaw, and (2) by gaining direct access to the tubers in the ground.”

THE ELM-BARK BEETLE.¹

By A. C. FORBES, Bowood, Calne, Wilts.

DISTRIBUTION.

THIS beetle is one of the most common members of the Bostrichidæ family which attack our indigenous trees in the south of England. It is especially numerous in those districts where the English elm (*Ulmus campestris*) forms the bulk of the hedgerow timber, and is supposed to evince a preference for that species.

Its geographical distribution extends over the greater part of Europe, being found wherever the elm is indigenous or has been introduced. Although it rarely commits serious ravages on healthy trees in country districts, old, sickly, or injured individuals are quickly attacked, and are usually killed outright in one or more years, according to the strength of the attacking force.

It is most frequently found in felled or blown timber, which has been left lying through the summer months, and its presence is easily detected by the dust which the female beetle throws out in boring her gallery. Although its attacks on *U. campestris* are most conspicuous in this country, the other species, *montana*, *suberosa*, &c., are selected by the beetle as readily if in a condition favourable for its purpose. Hess² includes it amongst those members of the beetle family which attack the ash; but such cases are probably exceptional, and only occur when its ordinary food material fails. It does not appear to

¹ *Scolytus destructor*, Olivier; *S. Geoffroyi*, Goetze; *S. Ratzeburgi*, Thomson; *Eccoptogaster scolytus*, Ratzeburg.

² Die Eigenschaften und das forstliche Verhalten der wichtigeren in Deutschland vorkommenden Holzarten. By Dr R. Hess.

increase suddenly in such overwhelming numbers as some species of the family are known to do; and this fact, coupled with its preference for felled or sickly trees, renders it a less formidable pest than it might otherwise prove.

S. destructor is usually accompanied in its work by *S. multi-striatus*, a beetle scarcely half the size of the former, but otherwise closely resembling it both in appearance and method of attack. It is perhaps more frequently found in the upper portions of the tree and under thinner bark than *destructor*, and according to Eichhoff¹ and others is somewhat later in swarming.

CHARACTERISTIC FEATURES.

The larvæ of the beetle are about one-sixth of an inch in length, legless, curved, wrinkled deeply on the upper side, and tapering to a blunt point at the tail. The first three segments behind the head and the terminal one are white, the remainder flesh-coloured or purplish, frequently mottled. When fully grown and nearing the pupal stage the whole of the maggot is white, with the exception of head and jaws, which are brown and black respectively. The pupæ are white, and almost inactive, with deeply furrowed and pointed abdomen.

The mature female beetle (fig. 43) is from one-sixth to one-fourth of an inch in length. The head, which is sunk well into the thorax, is almost square; and the forehead carries a patch of thick yellow hairs down the centre. The antennæ are moderately short, and terminate in knots composed of seven segments. The pronotum is jet black and shining, rather broad than long, and tapering towards the head. It is punctured with longitudinal lines of extremely fine dots or pits. The wing-cases are reddish brown, with broad black bands or patches, and marked lengthwise with punctured lines, slightly depressed near the inner edges. The intervening spaces are marked with two irregular rows of fine punctures. They become narrower towards

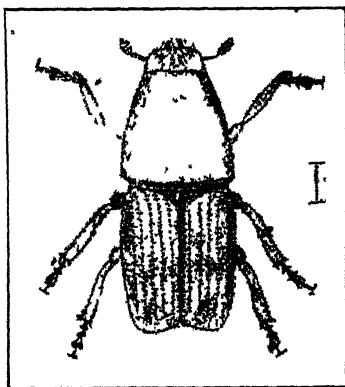


Fig 43.—*Elm-bark Beetle, female*
(magnified).

¹ Die Europäischen Borkenkäfer. Von W. Eichhoff. (Berlin, 1881)

the tips, and terminate without sloping downwards. The abdomen slopes inwards from the extremity to the second abdominal ring, and is almost bare,—the third and fourth rings being each provided with a small wart or tubercle, placed along the centre of the sloping surface. The legs are bristly, and feet reddish, the latter being composed of five (apparently four) tarsi.

The male differs from the female in being slightly smaller, and having the abdomen covered with grey hairs, with a fringe of tufted yellow hairs projecting at the extremity.

The specific characteristics which distinguish this beetle from the other *Scolyti*, but principally from *S. Ratzeburgi*, with which it has been frequently confounded, are furnished by Eichhoff as follows: "As a rule, smaller and narrower towards the hinder part than the birch-frequenting *S. Ratzeburgi*, with constantly brown, or more often blended, darkly blotched wing-cases; the forehead without keel, and shortly haired in both male and female. The intervals between the punctured lines on the wing-cases more distinctly, and usually irregularly, punctured. Abdomen of male provided with long hairs, and the third and fourth segments with a small wart in the centre of the under side."

LIFE-HISTORY.

The Mother Gallery.

When swarming takes place, the mother beetle takes flight for the purpose of finding a suitable spot for the boring of her gallery. The material suitable for this purpose having been found, she commences by working her way along a crevice of the bark of trunks of any size down to that of branches 2 inches or so in diameter, or wherever rough bark has been formed. After proceeding for a short distance along the bottom of the fissure, so that the real entrance is usually invisible from the exterior, she bores obliquely into the bark until either the wood or bast is reached, where the real mother gallery begins. This gallery is usually straight, from 1 to 4 inches in length, and proceeds from below upwards in standing trees. In posts placed in a perpendicular position the direction appears to be as often a downward one as not, but is invariably parallel to the long axis of the tree or branch, except it be in very knotty bark full of dwarf shoots, which interfere with the beetle's progress. The reason for the gallery being sometimes formed on the lower side of the bast and sometimes on the upper is not very clear; but in some trees almost the whole of the galleries run immediately below the bark.¹

¹ The distinction between true bark and bast must not be overlooked when mentioned in this and following paragraphs.

Pairing.

Pairing generally takes place as soon as the oblique portion of the gallery has been made, the female working her way backwards to the entrance and there awaiting the male, if he is not already there. The males appear to take no part in the formation of the gallery, and I have never found them in company with females except at pairing-time.

Oviposition.

After pairing, egg-laying proceeds along with the boring of the gallery—the eggs being deposited in specially prepared niches in a single row on each side of the gallery. Eichhoff believes them to be arranged by means of the mouth of the female, and the extreme regularity with which they are placed favours this view. After depositing the egg, the beetle packs it in with the dust which proceeds from the boring work, so that the sides of the gallery are quite smooth and even, and she may frequently be observed returning to the entrance for material which has been previously thrown out. This packing not only keeps the eggs in position, but also appears to preserve them from atmospheric influences; for should the gallery be exposed by removing the bark or bast above, the eggs are still capable of hatching, provided the dust is not disturbed. Their number usually varies from fifty to a hundred and fifty, but may fall below or exceed these numbers. In a well-filled gallery only the thinnest partition separates egg from egg, and they form a continuous row along its whole length. The beetle appears to pay great attention to keeping the mouth of her gallery open, and if it be stopped up by any loose material, she quickly clears it away, or if from its nature this should be impossible, she bores another opening.

The formation of *air-holes* in the mother gallery does not appear to have been noticed by many observers, as Altum¹ remarks on their rarity; but where the gallery runs immediately under the bark, they are apparently general, or almost so, although when under hard bark-scales they may not always reach the exterior. Ratzeburg² states that the mother gallery usually possesses two air-holes which always open into the bark fissures. So far as my observations go, however, they pierce directly through the bark-scales as often as not, and in such cases are not distinguishable externally from flight-holes. I have never found them when the gallery runs under the bast.

The life of the beetle quickly terminates after the completion

¹ Forst-Zoologie, Band iii. p. 243.

² Die Forst-Insecten (1837).

of egg-laying, which occupies three to six weeks, according to weather and other circumstances. She usually dies at the entrance of the gallery, with her back turned to all intruders. In some cases a hole is bored at the end of the gallery, but whether this is for exit purposes or not is uncertain.

Development of Larvæ.

The eggs hatch in about ten to fourteen days, and the larvæ commence feeding on the bast. Those on the under side destroy the *cambium* layer, and may also cut slightly into the wood, although the latter cases are comparatively rare, and probably only occur in the new wood-ring. These galleries at first run more or less at right angles to those of the mother gallery, and are separated by a thin partition when crowded, which is never broken through during the early stages. As the larvæ increase in size, the galleries diverge so as to give the necessary room for development, and those near the two ends of the mother gallery turn in a similar direction to it, so that the combined workings assume an elliptic form (fig. 44). These galleries are filled up behind, as the maggot proceeds, by the "worm-meal" or excreta, which is of a brick-red colour when fresh. Shortly before the larvæ cease feeding, they eat their way up from the surface of the wood to the bark (in many cases doubling back at an almost acute angle for a short distance), and there form a *pupa*-chamber. With a large majority this is formed in the bark-scales, within a quarter of an inch or so of the outer surface; a smaller number pupate immediately below the bark, while others again bore down into the wood itself, going as far as a quarter of an inch or more perpendicularly or obliquely into it. I am unable, however, to trace any connection between the pupa-chambers in the wood and the thickness of the bark, as stated by some authorities, as members of the same brood may show all three forms of chambers, with bark of uniform thickness. They appear rarely, if ever, to pupate in the bast, where the risk of destruction through excessive moisture would be greatest.

The metamorphosis from larva to imago occupies about twelve or fourteen days, when the immature beetle appears as a light-brown insect. While its chitinous covering is hardening it gradually works its way through the bark, leaving evidence of its escape in the shape of a hole in the bark-scales about the size of large shot. The life-history of the male is doubtful. Short burrows without egg-niches may often be found under the bark, and may possibly be his work. The apparent scarcity of males in comparison with females, together with their habits during pairing-time, would incline one to believe that polygamy

occurs, although such is contrary to the view held in regard to the Scolytini generally.

Period of Development.

The development of the beetle from egg to imago differs so widely as regards time in different families and individuals, that it has been considered advisable to deal with it separately.

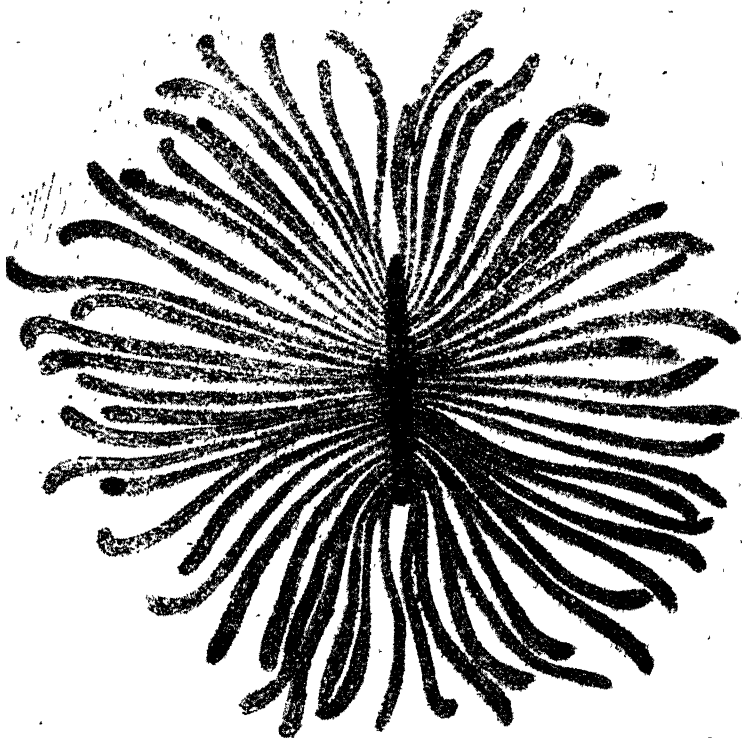


Fig. 44.—*Bast side of Elm-bark, with workings of Beetle and Larvæ* ($\frac{1}{2}$ nat. size).

This variation is caused by the great irregularity which occurs in the change from larva to pupa amongst members of the same brood, so that the larval stage may occupy a period of eight or ten weeks, or even extend to two years. Although the

latter period is doubtless abnormal, I believe it to be far from uncommon in crowded colonies. The result is, that we have a continuous appearance of swarming beetles from May till October, instead of swarms at regular periods, as is the case with many insects. Accurate observations are also rendered more difficult owing to the same tree frequently being attacked by successive generations, so that the larvæ of one get mixed with those of another by working into their galleries. This usually retards their development from lack of proper sustenance, and results in their emerging as beetles weeks or months after the usual time. Some may consider it better to ignore these belated individuals altogether, but in view of their numbers this would be scarcely justifiable from a practical point of view.

To ascertain the *normal development* of the beetle, we must confine our observations to freshly felled or blown timber, which has been thrown between October and May. So far as the writer's observations on such material go, the normal period appears to be as follows:—

The earlier beetles appear about the end of May or beginning of June, and commence burrowing and egg-laying soon after. The larvæ proceeding from these feed till about the middle of August, when they form a pupa-chamber as already described. A few, probably not more than 5 to 10 per cent, then pupate, and appear as beetles during the latter end of August and September. By far the greater number, however, hibernate as larvæ, and pupate the following summer, the majority in May and June, the others later. The latter—*late swarmers*, as they are termed—appear at intervals through the summer, their offspring hibernating as full or half-grown larvæ, according to the time of swarming. The larvæ of those swarming during June and July appear to finish their growth the same year, if in suitable material, but those of August swarmers are not mature until the following year, and form a different class of late swarmers from those mentioned above. Some of the latter probably pass two winters in the larval stage, but such are doubtless retarded in their growth as already explained.

Number of Generations.

Professor Altum (Forst-Zoologie) expresses his belief in a double generation for this beetle, but gives no conclusive proofs of such. He merely mentions having observed them swarming on recently felled trees on the 12th of August, which he took for members of a second generation. It is possible, however, that these might have been late swarmers; but even allowing them to be what he supposes, the question arises, "Can their

development be considered normal, or must we look upon them as *early* swarmers, and therefore abnormally developed?" Considering their relatively small numbers, the latter view seems to be (as regards this country) the more reasonable, especially as early swarming is not general, but only occurs with perhaps one out of ten, probably more favourably exposed to sun, &c.,



Fig 45 — *Elm bark, with workings* ($\frac{1}{2}$ nat size) a, Galleries in which only part of the eggs have hatched out, b, Galleries of *S. multistriatus*

than the rest. Neither Eichhoff nor Ratzeburg expresses any opinion on this point, but it is probably more or less dependent upon climate and season.

Fresh galleries may be observed up to and sometimes in October, but such late comers are probably of little practical im-

portance. Eichhoff believes that neither eggs nor young larvæ survive the winter, and galleries may often be found in which the eggs have only partially hatched, and the larval galleries lost their previous occupants (fig. 45, a).

Hibernation.

The half-grown larvæ which hibernate usually do so in a nearly torpid condition, ceasing to feed in October. That a spell of mild weather in mid-winter may arouse them to full activity is not probable, but galleries may sometimes be found with repeated gaps in the worm-meal, as though the inmates had remained inactive at two or three different periods, with alternating spells of feeding. No preparation appears to be made for hibernation, but they remain where they cease feeding until commencing again.

MATERIAL SELECTED FOR ATTACK.

The timber which appears most to the liking of the beetle is that which has been felled during the two or three previous winters, the degree of moisture still remaining in the bast making little difference so long as decay has not set in. Trees felled during the summer months are also attacked in a week or ten days afterwards, if lying within a short radius of a beetle colony. In winter-felled wood the borings are often stopped by a flow of mucilaginous fluid, which has been supposed by some to be sap, and to account for the beetle avoiding healthy trees. It appears, however, to be rather of the nature of a secretion, and may occur several days after the wound which causes it has been made. It may be noticed in trees that have been felled a considerable time, and is evidently of a saccharine nature from its attracting large numbers of wasps.

Next to felled timber, partially blown or damaged trees which have got into an enfeebled state, especially such as have been damaged by lightning, attract the beetles. With the latter, the attack is principally confined to the boundary-line between the dead and living bast; and should the tree be in a sickly condition, the larvæ push their way into the latter, and gradually destroy the whole tree in the course of a few years.

The question as to whether the beetle attacks *healthy trees* from choice or not, may, however, be safely answered in the negative so far as country districts in the south of England are concerned. When the quantity of felled timber and fallen branches is considered, which always remain more or less scattered about the fields and hedgerows during the summer, it is easily understood why standing trees in a healthy condi-

tion are so rarely attacked. With its favourite breeding material always at hand, the beetle is never tempted to select less suitable, if not repulsive, food in the shape of healthy living wood. The fact that the same timber is chosen by successive generations until scarcely a square inch can be found which the galleries of either beetle or larva have not been over, proves the great preference evinced for such before any other, and accounts for the almost total immunity from attack enjoyed by healthy trees.

Where the *ordinary breeding material fails* in the shape of felled timber, however, the case may be otherwise. Isolated clumps, or trees in public parks or gardens in large towns where tidiness is an important matter, run the greatest risk of attack. In such places all fallen limbs and blown or felled timber are quickly removed, and nothing is allowed to lie longer than is absolutely necessary. Should a colony of bark-beetles get established by any means in these places, it may easily prove a formidable foe to the hitherto healthy trees when the stock of sickly ones which attracted them in the first place has been exhausted. Hence is it that the majority of cases of beetle-attack cited in entomological works are located in or near towns, where the conditions are generally as described above.

Altum believes, however, that healthy trees are attacked in the upper branches, causing the trees to become top-dry and stag-headed, and that from these branches successive generations work their way down the stem until the whole tree is destroyed in the same way as the lightning-damaged ones.

Where such cases of attack on healthy trees do occur, however, it is probably owing to the absence of more suitable material, and the insects must either take what happens to be in the way or starve. This, at any rate, is the view of the matter taken by Eichhoff, while Altum and Ratzeburg incline to the belief that healthy trees are attacked from choice quite as much as from necessity.

REMEDIAL MEASURES.

The steps which should be taken when an attack on growing elms has occurred must depend upon the value set on the trees by the owner. In country districts where a few trees more or less are of little consequence, the best way is to cut them at once (unless they are especially prized as specimens) and bark the infested portions. This should be done at the end of July or beginning of August, as up to that time they will have served to attract late swarmers, which might otherwise do damage elsewhere.

The most elaborate method of treating elms already at-

tacked is that which M. Robert adopted with considerable success in France, and which, it is believed, has also been tried in this country.¹ This consists in either cutting out narrow strips of bark down the whole length of the stem, or in paring off the rough bark by means of a spoke-shave or similar instrument. The *rationale* of these processes is the stimulating of the tree to increased activity by relieving bark pressure, thus causing a greater rise and increase of sap in wood and bast. The precise way in which the desired object of killing the larvæ is attained, however, is rather doubtful. Some suppose it to be effected by presenting a too watery diet to them, while others suppose the exposure to atmospheric influence or the filling of the burrows with sap may bring it about.

I am inclined to think the last-mentioned supposition the correct one. I have succeeded in transplanting larvæ from dry bast to that of a healthy-growing tree, and found that after eating their way for a short distance in the new material they were stopped and drowned by the burrow being filled with sap. No other reason for their destruction at least appeared at all probable, and in felled trees they often share the same fate after forming the pupa-chamber, though in these cases the moisture is more probably rain which has soaked through the bark-scales than sap. That the watery diet brings about their death is rather doubtful when we consider that the bast of winter-felled trunks is quite as fresh for a considerable period as that of standing trees, although the absolute amount of moisture may be greater in the latter. By the removal of bark-scales it is possible that the larvæ, being deprived of their usual places for forming the pupa-chamber, are compelled to remain in the bast, where the chamber becomes filled with sap and their destruction ensues.

PREVENTIVE MEASURES.

The most effectual and also the most simple preventive measure that can be adopted is probably that of providing "catch-trees" or heavy branches, which can be barked after the beetles have used them for oviposition. As this method was fully described in vol. iii. of the 'Transactions' (Fifth Series), in an article by Professor Somerville on the "Pine Beetle," it need not be further discussed here, the principles involved being the same in both cases.

Where an attack on a particular tree is feared, however, by reason of its age or unthrifty condition, much good would probably be done by smearing portions of the stem and branches with one of the various caterpillar-limes prepared and sold for

¹ An account of this method was published in the 'Gardener's Chronicle and Agricultural Gazette,' April 29, 1848.

the purpose of smearing fruit-trees, &c., which would catch the beetles when travelling over the bark. The beetles being guided in their selection of and search for suitable material chiefly by the sense of smell, any of the strong-smelling oils and soaps, mixed up with clay, soot, cow-dung, &c., would displace the odour of the wood and cause the beetles to seek other breeding-ground. The latter measure, however, is one which could be carried out only on a very limited scale owing to the time and expense involved.

THE EFFECTS OF FOOD ON MILK AND BUTTER.¹

By JOHN SPIER, Newton Farm, Glasgow.

PROBABLY in no department of farming has the controversy between science and practice shown a greater divergence of opinion than in regard to the effect of food on milk and its products. The average dairyman and dairywoman believe that the better they feed their cows—that is, the more food they give them of any particular kind—the richer will be the milk. On the other hand, the results obtained by many recent experimenters who have attempted to get at the truth in this matter, seem to indicate that heavy feeding does not produce milk materially differing in butter-fat from rations more moderate in quantity. It seems to be generally assumed, that the use of any food, mixed or otherwise, which does not contain sufficient nutrients to maintain the body and keep up a moderate flow of milk, will sooner or later cause the cow to yield milk under average in quality. My investigations not having been turned in that direction, I am unable to throw any light on that aspect of the question.

A common belief exists that foods rich in oil will, when fed to cows, materially raise the percentage of butter-fat in their milk. Repeated and seemingly reliable experiments made in this country, in Denmark, Germany, Canada, and the United States of America, all indicate that the percentage of fat in the milk is not appreciably increased by an excess of oil in the food, nor is it materially lessened where the oil in the food is slightly deficient, provided the other ingredients of the food are supplied in abundance.

Others, again, maintain that the highest percentage of butter-fat in the milk is obtained when the cows are fed with a highly

¹ See vol. vi., Fifth Series (1894), p. 83.

nitrogenous food, such as beans, peas, or tares, and that it is from any excess of these nutrients, and not from the oil, that any increase in the fat of the milk is produced.

Presuming that an average stock of cows, fed with a moderate quantity of any well-balanced food, gives milk of, say, 3·5 per cent of fat, as shown by chemical analysis or one of the simpler methods now in use, it does not appear that supplying the cows with 25 or 50 per cent more of that food will make much difference on the proportion of fat in the milk. Until Dr Babcock introduced the present simple methods of testing milk for fat, the most erroneous ideas seemed to prevail regarding the composition of milk. For instance, each cow was generally supposed to give constantly one quality of milk, provided the feeding was the same, but that if any change was made in the feeding, the quality would according to circumstances go up or down. With the simple fat-tester in the hands of practical dairymen, it has been definitely proved that the percentage of fat in each cow's milk may vary from day to day without any apparent reason. These machines have also brought prominently under our notice another point which is worth referring to. While some foods have an apparent tendency to lower the percentage of fat, a few seem to have the power to slightly increase it, more especially when given in abnormal quantities. But the daily variations in the quality of the milk of each cow under the same feeding, housing, and general treatment, are greater than those caused by difference in rations if these are within ordinary limits. How these variations are brought about is as yet quite unknown, nor do we seem to be able to control them to any material extent.

Some critics seem to have an idea that, because particular experiments have failed to show any decided increase of fat in the milk from the use of certain foods, those who have conducted these experiments believe that a cow may be fed on any food, rich or poor, and yet yield a profitable supply of good milk. This is not the case. While such erroneous and exaggerated assertions evidently please those who make them, they do little to further the solution of a very difficult and intricate problem. It is an old saying, and a true one, that the cow milks by the mouth, and it might be extended and made to include the back; for unless food goes in by the mouth, milk will not long continue to come out of the udder. If, however, a cow has a strong tendency to produce milk, as usually happens with a good cow for several weeks after calving, she produces a not inconsiderable quantity of that milk from the flesh on her body as well as from the food in her stomach. In this case the power to yield milk seems greater than the power to digest food sufficient to produce it. As no cow can produce milk from

nothing, either less milk must be yielded or more materials supplied for its manufacture. While, therefore, the tendency to produce milk is at its maximum, the stomach of the cow is very often at its weakest, for after calving the cow is very easily surfeited by any excess of food. As the stomach of a heavy milking cow may thus be unable to digest sufficient food to replace the milk produced, the balance seems to be made up by the consumption of the flesh on the animal's body. Much the same appears to happen when a ration is used which is theoretically unevenly balanced—that is, contains a high or low amount of either albuminoids, oil, or starchy substances.

Former Experiments.

In most feeding experiments which have hitherto been made on cows in milk, the experimenters have generally confined themselves to ascertaining either the amount of fat and other solids in the milk by chemical analysis, or the quantity of butter produced by churning. There are few feeding experiments on record which show the butter-fat in the milk, and also the amount and percentage of butter-fat recovered in the butter, butter-milk, and skim-milk. In 1893¹ several cows, generally four, were fed here for nearly a year on various foods of a thoroughly distinctive character, each food being used for one month, and the milk of the last two weeks taken as showing the quality that food was likely to produce. On that occasion only weight of milk and butter-fat in the milk were ascertained for the whole period, the solids other than fats being only estimated for a portion of the time. No attempt was made to find out the effect of foods on the quantity or quality of the butter, or what amount of fat found in the milk was recovered in the butter, or what was lost in the skim or butter milk. Judged from the percentage of fat in the milk, these results, while indicating that at least one food—viz., brewers' grains—had the effect of lowering the quality of the milk, seemed also to show that the other foods experimented with had less effect on the milk than they were usually credited with. The results in part agreed with the opinions held by dairymen, yet they were in other respects contrary to the experiences of most butter-makers. While strongly holding the opinion that science is at all times the handmaiden of practice, I acknowledge that practice must always go first; and in this matter public experience was so far at variance with what seemed to be the teachings of science, that I felt inclined to believe that some material facts had not been taken into consideration. I therefore determined to repeat the ex-

¹ Fifth Series, vol. vi. (1894), p. 83.

periments last year (1895), and if possible make the investigations more thorough than they had previously been.

Plan of Experiments.

In planning the experiments of 1893, the intention was to select foods as widely divergent in character as possible, in order that the particular characteristics of each might be more clearly shown in the produce. For this reason albuminous, oily, and starchy foods were selected without in any way considering whether or not they were judiciously balanced or even economical. On this occasion much the same course was followed, but several foods were used now which had not previously been tried. Instead of confining my investigations to the percentage of fat in the milk produced by the consumption of the various foods, I intended them to show also the effect of the different foods on the "churnability" of the fat—that is to say, the percentage of the fat shown by analysis to be recovered as butter, and the percentage left in the skim-milk and butter-milk respectively. With that object in view, at first 4 lb., but latterly 5 lb. of milk were taken from the afternoon milk of each cow, and passed through a Humming-bird separator, kindly lent by the Dairy Supply Co. of Edinburgh, for the purpose of making these investigations. At first four cows in various stages of lactation were used, but a little later five, and later still six cows were employed, each of which had been a month or six weeks longer in milk than the other. According to the state of the weather, the cream was churned as soon as 100 lb. or 150 lb. of milk had been separated. During the gathering the cream was kept as cool as possible, and after the last had been added it was stirred, warmed, and ripened. This proceeding was probably not calculated to give the very best quality of butter; but what was bad for one was bad for all, the conditions being uniform.

Testing Milk.

After being sufficiently mixed, a sample was drawn from each cow's milk every evening, placed in a glass-stoppered bottle till the end of the week, when each composite sample was tested for fat, according to the method introduced by Dr Gerber of Zurich. The preservative used was bichromate of potash, a pinch of which in each bottle kept the milk quite fluid even in the warmest weather. These composite samples greatly reduced the labour of analysis, while they gave an opportunity of comparing the actual amount of butter-fat in the milk used with the butter made from that same milk, without the necessity of testing each cow's milk every night.

The composite samples were always tested in duplicate, and during a portion of the time three determinations were made of each sample. In an experiment of this kind a great deal depends on the accuracy with which the samples are drawn, as inaccurate sampling will be followed by irregular and misleading results. Few people can realise how quickly the larger-sized globules of fat rise to the surface, and if any delay occur—even to the extent of a few seconds—in drawing the sample after mixing, the results are sure to be unreliable. In drawing samples there is little chance of the percentage of fat in the samples being less than that of the bulk, but there is always some risk of the sample being richer than the bulk. It will be noticed further on that where the fat in the milk is compared with that found in the products, there is usually a considerable quantity wanting. I account for that discrepancy more from inaccurate sampling than from the loss in the process of manufacture.

Each evening after the milk had been passed through the separator, a sample of the mixed separated milk was also taken, and the composite sample tested with the others at the end of the week. The composite samples were all tested in duplicate, and when any material discrepancy existed between the results, the work was gone over again. In this way from fourteen to twenty samples were tested each week, and during the progress of the investigations over 2 gallons of concentrated sulphuric acid have been used. Before measuring the milk, and in taking the specific gravity in order to find the solids other than fats, the milk was always brought to the temperature of 60° Fahr.

Melting-point of Butter.

As it was also thought that the various foods used might have considerable influence on the firmness of the butter, the melting-point of the butter of each churning was determined in the following manner. A piece of butter fully larger than a pea was placed on the bulb of a thermometer, which was inserted in a test-tube filled with water. The water was slowly heated by the flame of a spirit-lamp, and, as the melting-point was approached, the temperature of the water was only raised from $\frac{1}{2}$ ° Fahr. to 1° Fahr. at a time. Before the melting-point was reached, the butter usually assumed an elongated form, and ultimately a small portion of it separated and rose to the top as a globule of melted fat. The temperature recorded by the thermometer at the time that the first globule rose to the surface was taken as the melting-point, and as a rule three, four, or more samples of the butter of each churning were tested in this way. The method of testing the melting-point of the vari-

ous butters did not give so uniform results as I would have liked, even although each was repeated many times; consequently they should be regarded only as close approximations.

The live-weight of each animal used was taken on two separate days at the beginning and end of each change of food, the mean of the two weighings being taken as the actual weight.

Fat in Butter.

At first no estimation was made of the amount of pure fat in the various butters produced, each being worked till all available water was extracted. As will be seen from the tables, the total fat found in the milk did not always correspond as closely as it might have done with that presumed to be in the butter, butter-milk, and skim-milk. It was therefore decided to ascertain the amount of pure fat in each lot of butter, instead of calculating it at 85 per cent as formerly. By this precaution it was hoped to account for all the butter-fat in the milk more exactly than had hitherto been possible, and without it some of the results which were met with later on would have been extremely misleading. As a rule, the pure fat and water in fresh butter make up 99 per cent of the whole, so that for all practical purposes the excess over the pure fat may be considered as water.

Yield of Milk.

Each cow's milk was weighed in the afternoon only. The weight of milk given as the yield of each week is calculated from that produced at the afternoon milking, which was weighed daily. This was doubled for the total of each day, although in reality it would be more than double, as there were only eleven hours between the morning and afternoon milking, while there were thirteen between the afternoon and morning.

Duration of Trial and Foods used.

The following table shows the duration of the trial and food given to the cows during each period:—

| Period. | No. of weeks. | Beginning. | Ending. | Cows under experiment. | | | | | | | | Food used. |
|---------|---------------|-----------------|------------------|------------------------|----|----|----|---|---|--|--|--|
| | | 1895. | 1895 | No. | | | | | | | | |
| I. | 3 | May 26 | June 15 | 1 | 2 | 3 | 4 | | | | | Pasture. |
| II. | 4 | June 16 | July 13 | 1 | 2 | 3 | 4 | | | | | Green vetches <i>ad libitum</i> . |
| III. | 4 | July 14 | Aug. 10 | 1 | 2 | 3 | 4 | | | | | Green vetches and 8 lb. dried grains. |
| IV. | 4 | Aug. 11 | Sept. 7 | 1 | 2 | 3b | 4 | | | | | Indian meal 4 lb., barley-meal 4 lb., and green Italian. |
| V. | 4 | Sept. 8 | Oct. 5 | 1 | 2 | 3b | 4 | 5 | | | | Bean-meal 8 lb., and green Italian. |
| VI. | 5 | Oct. 6 | Nov. 9 | 1 | 2 | 3b | 4b | 5 | | | | Paisley meal 8 lb., and green Italian. |
| VII. | 5 | Nov. 10 | Dec. 14 | 1 | 2 | 3b | 4c | 5 | | | | Oats bruised 15 lb., cabbages, and second-cut hay. |
| VIII. | 5 | Dec. 15 | 1896. Jan. 18 | 1 | 2 | 3b | 4c | 5 | 6 | | | Linseed-cake 7 lb., cabbages, and second-cut hay. |
| XI. | 5 | 1896 Jan. 19 | Feb. 22 | 1b | 2b | 3c | 4c | 5 | 6 | | | Decorticated cotton-cake 7 lb., treacle, potatoes, and second-cut hay. |

The experiment began on 26th May, when the cows had been on pasture for nearly one month.

Cow No. 1 had been calved 1 month.

" 2 " " 2½ months.

" 3 " " 4 "

" 4 " " 5 "

As the quality as well as the quantity of milk varies with the period of lactation, though to a less extent, it was thought this cause of variation might be minimised by adding a freshly calved cow, when the milk of any of the others fell below a certain limit.

In the first week the four cows gave milk containing an average of 3·6 per cent of butter-fat, while the milk of the second week contained 3·52 per cent.

PERIOD I.

Pasture.

For the week ending 15th June each animal yielded milk of the following composition:—

| | | | | | Fat. Per cent. | Solids other than fats. Per cent. |
|-----------|---|---|---|---|-------------------|--------------------------------------|
| Cow No. 1 | . | . | . | . | 3·5 | 9·33 |
| " 2 | . | . | . | . | 3·65 | 8·83 |
| " 3 | . | . | . | . | 3·45 | 9·05 |
| " 4 | . | . | . | . | 3·5 | 8·80 |
| Average | | | | | 3·52 | 9·00 |

On an average of three trials of milk from pasture, the following results were obtained:—

| | | | | |
|--|---|------------------------|---|---------------------|
| Butter per 100 lb. of milk | . | . | . | 3.77 lb. |
| Percentage of fat in the butter-milk | . | . | . | 1.25 ¹ |
| Melting-point of the butter | . | . | . | 90.1° Fahr. |
| Milk to 1 lb. of butter | . | . | . | 26.5 lb. |
| Total butter-fat available per 100 lb. of milk | . | . | . | 3.55 " ^a |
| Fat recovered in the butter | . | 3.204 lb. ³ | | |
| " " butter-milk | . | .125 " | | |
| " " skim-milk | . | .212 " | | |
| Fat unaccounted for | . | .009 " | | |
| | | | | <hr/> 3.55 " |

Percentage of fat in the milk recovered in the butter, 90.2.

The churnings were done at 57° Fahr. in a Sinton barrel-churn.

The determination of fat in the butter-milk was not commenced till near the end of this period, and before the relatively high amount entered above had been obtained, a change of food had been made, and this result—to my regret—could not be confirmed. It is verified, however, by the weight of butter, and we may therefore take it that about 90 per cent of the fat in the milk was recovered in the butter when the cows were consuming the fresh young growth of these pastures, which are from fifteen to eighteen years old.

The total milk yielded during each week of this period was as follows:—

| | | | | | |
|----------------------------|---|---|---|---|----------------|
| | | | | | For four cows. |
| | | | | | lb. |
| 1st week | . | . | . | . | 1058 |
| 2d " | . | . | . | . | 1072 |
| 3d " | . | . | . | . | 1102 |
| | | | | | <hr/> |
| Average of 2d and 3d weeks | . | | | | 1087 |

PERIOD II.

Vetches with a little Green Oats.

In anticipation of this test, vetches with a few oats had been sown in spring at intervals of about ten days. The first-sown plot of these being now in good condition to cut, a commencement was made with them on 16th June. During this period the cows were limited to vetches alone, each animal consuming daily about 1½ cwt. During the whole period that this food was used it was always in a fresh succulent condition, and in much the same stage of growth from the beginning of the month to the end, for as one plot was used up another came in at a little greener stage.

¹ The average of the third churning only.

² The average of three weeks.

³ Assuming the butter to contain 85 per cent of pure fat.

Vetches. Third Week.

| | Fat Per cent. | Solids other than fats. Per cent. |
|--|------------------------|--------------------------------------|
| Cow No. 1 | 4.05 | 8.92 |
| " 2 | 3.80 | 8.47 |
| " 3 | 4.10 | 8.67 |
| " 4 | 3.60 | 8.56 |
| Average | <u>3.89</u> | <u>8.65</u> |
| Butter per 100 lb. of milk | . | 4.5 lb. |
| Percentage of fat in the butter-milk | . | .6 |
| Melting-point of the butter | . | 90° Fahr. |
| Milk to 1 lb. of butter | . | 22.2 lb. |
| Total butter-fat available per 100 lb. of milk | . | 3.89 " |
| Fat recovered in the butter | 3.825 lb. ¹ | |
| " " butter-milk | .060 " | |
| " " skim-milk | .212 " | |
| | <u>4.097 lb.</u> | |
| Fat unaccounted for in excess | . | .207 " |
| | | <u>4.097 lb.</u> |

Percentage of fat in the milk recovered in the butter, 98.3.

Vetches. Fourth Week.

| | Fat. Per cent. | Solids other than fats. Per cent. |
|--|------------------------|--------------------------------------|
| Cow No. 1 | 3.65 | 9.75 |
| " 2 | 3.80 | 9.26 |
| " 3 | 4.15 | 9.47 |
| " 4 | 4.25 | 9.22 |
| Average | <u>3.96</u> | <u>9.42</u> |
| Butter per 100 lb. of milk | . | 4.234 lb. |
| Percentage of fat in the butter-milk | . | .4 |
| Melting-point of the butter | . | 92° Fahr. |
| Milk to 1 lb. of butter | . | 23.5 lb. |
| Total butter-fat available | . | 3.96 " |
| Fat recovered in the butter | 3.599 lb. ¹ | |
| " " butter-milk | .040 " | |
| " " skim-milk | .212 " | |
| Fat wanting | .109 " | |
| | <u>3.96</u> | <u>"</u> |

Percentage of fat in the milk recovered in the butter, 90.9.

Average of the Third and Fourth Weeks on Vetches.

| | Fat. Per cent. | Solids other than fats. Per cent. |
|---|-------------------|--------------------------------------|
| | 3.92 | 9.03 |
| Butter per 100 lb. of milk | . | 4.367 lb. |
| Percentage of butter-fat recovered ¹ | . | 94.6 |
| " fat in the butter-milk | . | .5 |
| Melting-point of the butter | . | 90° Fahr. |
| Milk to 1 lb. of butter | . | 22.85 lb. |

¹ Assuming the butter to contain 85 per cent of pure fat.

Milk.

The following quantities of milk were yielded during each week of this period:—

| | By four cows. | | | | | |
|-------------------------------|---------------|---|---|---|---|------------|
| | lb. | | | | | |
| 1st week | . | . | . | . | . | 885 |
| 2d " | . | . | . | . | . | 696 |
| 3d " | . | . | . | . | . | 598 |
| 4th " | . | . | . | . | . | 518 |
| Average of 3d and 4th weeks . | | | | | | <u>558</u> |

While on pasture, the four cows yielded for each of the last two weeks they were out an average of 1087 lb. per week, while for the third and fourth weeks on vetches the average was 558 lb., or a decrease of 48·7 per cent from what they were previously yielding. This is the more remarkable, seeing the vetches were extremely succulent, were cut fresh daily, and were just coming into bloom. After having been allowed to go out the cows doubtless fretted at being again shut up, and apparently wearied a little at first. The weight of green food eaten daily was very considerable, and compares most unfavourably with the yield of milk. Although I had always been a user of vetches to a greater or less extent, I had never met with a similar experience before. I had, however, previously heard that in the south of England, where vetches, or at least the variety called winter tares, are more extensively grown than in Scotland, it was found that where largely fed to cows in milk, they had the effect of restricting the milk-yield. In my travels I have not had the good fortune to come across any one who had had personal experience of this matter.

Butter and Butter-fat.

The butter was of good colour and very firm, the melting-point during the fourth week being decidedly high. No bad flavour was noticed from the excessive use of the vetches. The butter-fat rose from 3·55 per cent when the cows were on pasture to 3·92 per cent during the third and fourth weeks of this period, or a gain equal to 10·5 per cent. During this period the average per cent of butter-fat in the milk of each week was as follows:—

| | | | | | | |
|--------------------|---|---|---|---|---|------|
| 1st week | . | . | . | . | . | 4·2 |
| 2d " | . | . | . | . | . | 3·86 |
| 3d " | . | . | . | . | . | 3·89 |
| 4th " | . | . | . | . | . | 3·96 |

While the cows were on pasture 90·1 per cent of the fat in

their milk was recovered in the butter, but while on vetches the average of the third and fourth weeks is 94·6 per cent.

On the assumption that the butter of the third week contained 85 per cent of fat, we obtain a greater amount of fat in the products than the milk actually contained. Calculating from the fat left in the butter-milk and skim-milk, we find that 93 per cent of the fat was recovered in the butter. Taking this with the fourth week, when the results seem more reliable, the proportion of fat in the milk recovered in the butter is decidedly higher than when the cows were on pasture.

Owing, however, to the very restricted yield of milk during this period, the yield of butter per cow per week is very much less than when the cows were on pasture. There was a gain of butter-fat in the milk, and apparently a decided gain in the percentage recovered as butter, but the total yield of milk was so small that these gains were entirely swamped. During this period the average weight of butter produced during each week from 100 lb. of milk was as follows:—

| | | | | | | lb. |
|----------|---|---|---|---|---|-------|
| 1st week | . | . | . | . | . | 4·0 |
| 2d " | . | . | . | . | . | 3·90 |
| 3d " | . | . | . | . | . | 4·5 |
| 4th " | . | . | . | . | . | 4·234 |

The average weight of milk required to produced 1 lb. of butter was as follows:—

| | | | | | | lb. |
|----------|---|---|---|---|---|------|
| 1st week | . | . | . | . | . | 25·0 |
| 2d " | . | . | . | . | . | 25·6 |
| 3d " | . | . | . | . | . | 22·2 |
| 4th " | . | . | . | . | . | 23·5 |

The average melting-point of the butter of each week during the period that vetches were used was as follows:—

| | | | | | | Fahr. |
|----------|---|---|---|---|---|-------|
| 1st week | . | . | . | . | . | 90° |
| 2d " | . | . | . | . | . | 90° |
| 3d " | . | . | . | . | . | 90° |
| 4th " | . | . | . | . | . | 92° |

Solids other than Fats.

During this period the solids other than fats seem to have varied very much, indicating either ill-health or injudicious feeding. It is, however, worthy of notice that, with the exception of the third week, the solids other than fats are particularly high. In previous tests, nitrogenous foods have usually given a high percentage of solids other than fats, and others when using similar food-stuffs have had much the same experience.

The average solids other than fats in the milk of each week were as follows :—

| | Per cent. |
|--------------------|-----------|
| 1st week | ... |
| 2d " | 9.11 |
| 3d " | 8.65 |
| 4th " | 9.42 |

Vetches and 8 lb. dried Distillery Grains.

Grains, or draff, as they are usually called in Scotland, are generally credited with having a tendency to increase the flow of milk, and at the same time to reduce its quality. As the quality of the milk had increased materially during the past week, while its quantity had decreased to even a greater extent, it occurred to me that the present occasion afforded a very suitable opportunity for testing the effect of a combination of these foods. For the next month, therefore, the cows were fed on 8 lb. of dried grains daily, and in addition as many vetches as they cared to eat, which was found to average about 1 cwt. daily for each animal.

PERIOD III.

Vetches and 8 lb. Dried Grains. Third Week.

| | Fat. Per cent. | Solids other than fats. Per cent. |
|--|------------------------|--------------------------------------|
| Cow No. 1 | 3.5 | 9.59 |
| " 2 | 3.4 | 9.57 |
| " 3 | 3.35 | 9.56 |
| " 4 | 3.75 | 9.66 |
| Average | <u>3.5</u> | <u>9.59</u> |
| Butter per 100 lb. of milk | | 3.625 lb. |
| Percentage of fat in the butter-milk | | .65 |
| Melting-point of the butter | | 91° Fahr. |
| Milk to 1 lb. of butter | | 27.6 lb. |
| Total butter-fat available per 100 lb. of milk | | 3.5 " |
| Fat recovered in the butter | 3.081 lb. ¹ | |
| " " butter-milk | .065 " | |
| " " skim-milk | .212 " | |
| Fat unaccounted for | .142 " | |
| | <u>3.5 lb.</u> | <u>3.5 lb.</u> |

Percentage of fat in the milk recovered in the butter, 87.7.

¹ Assuming the butter to contain 85 per cent of pure fat.

Vetches and 8 lb. Dried Grains. Fourth Week, ending 10th August.

| | Fat Per cent. | Solids other than fats. Per cent. |
|--|------------------------|--------------------------------------|
| Cow No. 1 | 3·65 | 9·23 |
| " 2 | 3·7 | 8·84 |
| " 3 | 3·8 | 9·13 |
| " 4 | 3·65 | 9·23 |
| Average | <u>3·7</u> | <u>9 11</u> |
| Butter per 100 lb. of milk | | 3·687 lb. |
| Percentage of fat in the butter-milk | | ·78 |
| Melting-point of the butter | | 93° Fahr. |
| Milk to 1 lb. of butter | | 27·1 lb. |
| Total butter-fat available for 100 lb. of milk | | 3·7 " |
| Fat recovered in the butter | 3·134 lb. ¹ | |
| " " butter-milk | ·078 " | |
| " " skim-milk | ·212 " | |
| Fat unaccounted for | ·276 " | |
| | <u>3·7 lb.</u> | <u>3·7 lb.</u> |

Percentage of fat in the milk recovered in the butter, 84·7.

Average of the Third and Fourth Weeks when dried Grains and Vetches were given to the Cows.

| | Fat. Per cent. 3·6 | Solids other than fats. Per cent. 9·35 |
|--|--------------------------|--|
| Butter per 100 lb. of milk | | 3·656 lb. |
| Percentage of butter-fat in the milk recovered in the butter ¹ | | 87·7 |
| Melting-point of the butter | | 92° Fahr. |
| Percentage of fat in the butter-milk | | ·71 |
| Milk to 1 lb. of butter | | 27·35 lb. |

Milk.

During this period the following quantities of milk were yielded during each week:—

| | By four cows. lb. |
|---------------------------------------|----------------------|
| 1st week | 689 |
| 2d " | 775 |
| 3d " | 682 |
| 4th " | 644 |
| Average of 3d and 4th weeks | <u>663</u> |

Comparing the last two weeks of this period with the corresponding two weeks when vetches only were given to the cows, the volume of milk increased nearly 19 per cent, although the period of lactation was one month further advanced. Com-

¹ Assuming the butter to contain 85 per cent of pure fat.

paring the second week of this period with the last week when vetches only were used, the increase in volume of milk is 49 per cent, while the decrease in fat is 18·7 per cent.

Butter-fat and Butter.

The comparatively low percentage of butter-fat in the milk during the period that grains were used corroborates the results obtained here by the same food in 1893. During this period the average per cent of fat in the milk of each week was as follows:—

| | |
|--------------------|------|
| 1st week | 3·38 |
| 2d " | 3·22 |
| 3d " | 3·51 |
| 4th " | 3·70 |

For the first two weeks the butter-fat fell considerably, the minimum being reached in the second week, when it stood at 3·22 per cent. During the period when vetches alone were used the minimum period was also the second week; but while the best results are here given at the end, with vetches the best results were obtained in the first week. The amount of butter-fat on this occasion was not so low as it was in 1893, the result no doubt of the vetches being used along with the grains, while on the previous occasion the green fodder used was sewage-grown Italian ryegrass. The popular belief is that sewage-grown Italian ryegrass and grains have a strong tendency to produce thin milk, and that vetches exercise an influence in the opposite direction. The experiments of 1893 and those of this year all strongly corroborate that view. Comparing the period of minimum butter-fat with the last week when vetches only were used, the fall is equal to 18·7 per cent.

While the milk was not in any way abnormally low in quality during this period, the weight of butter produced, and consequently the percentage of fat recovered in the butter, was very much less than hitherto. The average weight of butter produced during each week from 100 lb. of milk was as follows:—

| | |
|--------------------|-------|
| | lb. |
| 1st week | 3·75 |
| 2d " | 3·406 |
| 3d " | 3·625 |
| 4th " | 3·687 |

The average weight of milk required to produce 1 lb. of butter was as follows:—

| | |
|--------------------|------|
| | lb. |
| 1st week | 26·9 |
| 2d " | 29·3 |
| 3d " | 27·6 |
| 4th " | 27·1 |

If the results obtained on this occasion are borne out by later experience, they would seem to indicate that the use of grains in large quantities not only lowers the percentage of butter-fat in milk, but in addition reduces the value of that fat for butter-making by rendering a portion of it unrecoverable by the ordinary process of churning. With vetches only, the percentage of fat recovered in the butter was 90·9, which was slightly greater than when the cows were on the pastures. This would seem to indicate that milk produced from the consumption of vetches had, if anything, a fully larger proportion of its fat in a condition in which it might be recovered by churning than the milk produced from the consumption of young grass from an old pasture. If such is the case, the effect of grains in the opposite direction must be greater than is here indicated, as, had the good effect of the vetches on the "churnability" of the milk not been exercised, the lowering effect of the grains might have been even more apparent. During this period the average percentage of fat in the milk recovered in the butter was as follows:—

| | |
|--------------------|------|
| 1st week | 94·3 |
| 2d " | 89·9 |
| 3d " | 87·7 |
| 4th " | 84·7 |

Even, therefore, with the addition of 1 cwt. of vetches daily, the "churnability" of the milk produced from a large allowance of grains is very far below that of milk from new grass, which was 90·2 per cent, or a gain over vetches and grains of 5·5 per cent. It is also worthy of notice that the butter was of very open texture, locally called "fozy" or spongy, and that had its purity been tested the fat might have been more accurately accounted for.

Another point worth noting is the percentage of fat left in the butter-milk, which during this period was as follows:—

| | |
|--------------------|-----|
| 1st week | ·37 |
| 2d " | ·75 |
| 3d " | ·65 |
| 4th " | ·78 |

Solids other than Fats.

During the first and second weeks, while grains were being used, the solids other than fats fell a little, but not to anything like the extent of the fats. For each week during this period the percentage was as follows:—

| | |
|--------------------|------|
| 1st week | 8·84 |
| 2d " | 9·12 |
| 3d " | 9·59 |
| 4th " | 9·11 |

While the butter-fat reached its minimum in the second week, the solids other than fats did so during the first week. Compared with the fourth week, when vetches only were used, the minimum of solids other than fats is .58 per cent less, or a fall equal to 6.2 per cent, counting the last week when vetches were used as 100. Grains and vetches had therefore much greater effect in reducing the fat than the other solids in the milk.

PERIOD IV.

8 lb. of equal quantities of Maize and Barley-meal, with sufficient Italian Grass to keep the Cows in good health.

The previous foods had been of a highly nitrogenous character, that of a month ago unusually so; it was therefore arranged that the next food should be a carbonaceous or starchy one. In the tests of 1893 both maize and barley had been used separately, and while there was a difficulty for a time in inducing the animals to eat their full quantity of Indian corn-meal, there was none with the barley-meal. As both grains are of very much the same composition, it was decided on this occasion to use them mixed. The grains were ground into meal, which was mixed with a little chaff, over which boiling water was poured an hour or two before being given to the animals.

Live-weights of the Cows.

| | | Average of 10th & 12th Aug. lb. | Average of 7th & 9th Sept. lb. | Difference. lb. |
|-----------|---|---------------------------------------|--------------------------------------|--------------------|
| Cow No. 1 | . | 900 | 882 | 18 — |
| " 2 | . | 784 | 754 | 30 — |
| " 3b | . | 812 | 794 | 18 — |
| " 4 | . | 953 | 915 | 38 — |
| " 5 | . | ... | 850 | ... |

At the beginning of this period cow No. 3b was substituted for cow No. 3, as the latter was very much reduced in her milk-yield, and it seemed as if before the end of the month she might not give the 5 lb. of milk necessary for separating.

Indian Corn and Barley-meal. Third Week, ending 31st August.

| | | Fat. Per cent. | Solids other than fats. Per cent. |
|-----------|---|-------------------|--------------------------------------|
| Cow No. 1 | . | 3.9 | 9.29 |
| " 2 | . | 3.75 | 8.72 |
| " 3b | . | 3.6 | 9.22 |
| " 4 | . | 3.4 | 8.78 |
| Average | | <u>3.662</u> | <u>9.00</u> |

| | | | |
|--------------------------------------|------------------------|---|------------------|
| Butter per 100 lb. of milk | . | . | 4.086 lb. |
| Percentage of fat in the butter-milk | . | . | 1.5 |
| Melting-point of the butter | . | . | 92° Fahr. |
| Milk to 1 lb. of butter | . | . | 24.5 lb. |
| Total butter-fat available | . | . | 3.662 " |
| Fat recovered in the butter | 3.473 lb. ¹ | . | |
| " " butter-milk | .15 " | . | |
| " " skim-milk | .212 " | . | |
| Fat unaccounted for in excess | ... | . | .173 " |
| | <u>3.835 lb.</u> | | <u>3.835 lb.</u> |

Percentage of butter-fat in the milk recovered in the butter, 94.8.

The excess of fat here is probably accounted for by the high percentage of water in the butter.

Indian Corn and Barley-meal. Fourth Week, ending 2d September.

| | Fat. Per cent. | Solids other than fats. Per cent. |
|-----------|-------------------|--------------------------------------|
| Cow No. 1 | 3.7 | 9.37 |
| " 2 | 3.9 | 9.15 |
| " 3b | 3.7 | 9.37 |
| " 4 | 3.7 | 9.11 |
| Average | <u>3.74</u> | <u>9.25</u> |

| | | | |
|--------------------------------------|-----------------------|---|---------------|
| Butter per 100 lb. of milk | . | . | 3.906 lb. |
| Percentage of fat in the butter-milk | . | . | 1.2 |
| Melting-point of the butter | . | . | 92.5° Fahr. |
| Milk to 1 lb. of butter | . | . | 25.6 lb. |
| Total butter-fat available | . | . | 3.74 " |
| Fat recovered in the butter | 3.32 lb. ¹ | . | |
| " " butter-milk | .12 " | . | |
| " " skim-milk | .21 " | . | |
| Fat unaccounted for | .09 " | . | |
| | <u>3.74</u> | | <u>3.74 "</u> |

Percentage of butter-fat in the milk recovered in the butter, 88.7.

Indian Corn and Barley-meal. Average of the Third and Fourth Weeks.

| | Fat. Per cent. | Solids other than fats. Per cent. |
|--|-------------------|--------------------------------------|
| | 3.7 | 9.12 |
| Butter per 100 lb. of milk | . | 3.996 lb. |
| Percentage of fat in the milk recovered in the butter ¹ | . | 91.7 |
| Percentage of fat in the butter-milk | . | 1.35 |
| Melting-point of the butter | . | 92.25° Fahr. |
| Milk to 1 lb. of butter | . | 25 0 lb. |

¹ Assuming the butter to contain 85 per cent of pure fat.

Milk.

The milk yielded during each week of this period was as follows:—

| | By four cows. | | | | | |
|-------------------------------|---------------|---|---|---|---|--------------|
| | lb. | | | | | |
| 1st week | . | . | . | . | . | 619 |
| 2d " | . | . | . | . | . | 541 |
| 3d " | . | . | . | . | . | 540 |
| 4th " | . | . | . | . | . | 503 |
| Average of 3d and 4th weeks . | | | | | | <u>521.5</u> |

If the average of the last two weeks be taken as a basis, the yield fell off 22 per cent from what it was during the corresponding weeks with the previous food. This happened notwithstanding the fact that a newly calved cow (3*b*) was substituted for cow No. 3.

Butter and Butter-fat.

The butter produced was usually fairly firm, and of moderately good colour and flavour. The amount of fat in the butter-milk was, however, high, the percentage for each of the four weeks being as follows:—

| | | | | | | |
|--------------------|---|---|---|---|---|------|
| 1st week | . | . | . | . | . | 1.35 |
| 2d " | . | . | . | . | . | 1.4 |
| 3d " | . | . | . | . | . | 1.5 |
| 4th " | . | . | . | . | . | 1.2 |

It is also very noticeable that the percentage of butter-fat in the milk varied very little from week to week, the quality being more constant with this food than with any of those tried hitherto:—

| | | | | | | |
|--------------------|---|---|---|---|---|------|
| 1st week | . | . | . | . | . | 3.60 |
| 2d " | . | . | . | . | . | 3.65 |
| 3d " | . | . | . | . | . | 3.66 |
| 4th " | . | . | . | . | . | 3.74 |

During each week of this period the following weights of butter were yielded per 100 lb. of milk:—

| | lb. | | | | | |
|--------------------|-----|---|---|---|---|-------|
| 1st week | . | . | . | . | . | 3.532 |
| 2d " | . | . | . | . | . | 3.672 |
| 3d " | . | . | . | . | . | 4.086 |
| 4th " | . | . | . | . | . | 3.906 |

The following weights of milk were required to produce 1 lb. of butter:—

| | lb. | | | | | |
|--------------------|-----|---|---|---|---|------|
| 1st week | . | . | . | . | . | 28.3 |
| 2d " | . | . | . | . | . | 27.2 |
| 3d " | . | . | . | . | . | 24.5 |
| 4th " | . | . | . | . | . | 25.6 |

The percentage of butter-fat in the milk recovered in the butter was usually very low, and although the result of the third week has raised considerably the average of the last two weeks, still there is good reason for believing that the results of that week are due to the assumption that the butter contained 85 per cent of pure fat, and are therefore unreliable. The percentage recovered each week was as follows:—

| | |
|--------------------|------|
| 1st week | 83·4 |
| 2d " | 85·5 |
| 3d " | 94·8 |
| 4th " | 88·7 |

During the time that Indian corn and barley-meal were used the melting-point of the butter was comparatively high, being fully 2° Fahr. above that of the butter made when the cows were on pasture.

The melting-points for each week were as follows:—

| | |
|--------------------|-------|
| | Fahr. |
| 1st week | 91° |
| 2d " | 91·5° |
| 3d " | 92° |
| 4th " | 92·5° |

Solids other than Fats.

Other investigators have usually found that the excessive use of foods rich in starch produced milk if anything under average in solids other than fats. This test has given very much the same results, although the percentage cannot be considered under the normal. The average percentage of solids other than fats during each week of this period was as follows:—

| | |
|--------------------|------|
| 1st week | 8·98 |
| 2d " | 9·32 |
| 3d " | 9·00 |
| 4th " | 9·25 |

During this period the solids other than fats have varied more than the fats.

PERIOD V.

Bean-meal 8 lb., and sufficient Italian Grass to keep the Cows in health.

The use of this food began on 7th September, the number of cows being at the same time increased from four to five, by the addition of another cow recently calved. In Scotland almost

no concentrated food is in so good repute with dairymen as bean-meal, but, strange to say, it is in much less demand in other countries. The bean-meal was ground at home from Egyptian beans, so that its purity was guaranteed.

Live-weights of the Animals.

| | | 7th and 8th Sept. lb. | 5th and 7th Oct. lb. | Difference. lb. |
|-----------|---|--------------------------|-------------------------|--------------------|
| Cow No. 1 | . | 882 | 906 | 24 + |
| " 2 | . | 754 | 798 | 44 + |
| " 3b | . | 794 | 840 | 46 + |
| " 4 | . | 915 | 954 | 39 + |
| " 4b | . | ... | 840 | ... |
| " 5 | . | 850 | 783 | 67 - |

Bean-meal 8 lb., and a little Italian Grass. Third Week, ending 28th September.

| | | | Fat. Per cent. | Solids other than fats. Per cent. |
|-----------|---|---|-------------------|--------------------------------------|
| Cow No. 1 | . | . | 3.85 | 9.01 |
| " 2 | . | . | 3.95 | 8.90 |
| " 3b | . | . | 4.0 | 9.17 |
| " 4 | . | . | 4.5 | 9.15 |
| " 5 | . | . | 4.15 | 9.47 |
| Average | | | 4.09 | 9.14 |

| | | | |
|--|---|------------------------|-----------|
| Butter per 100 lb. of milk | . | . | 4.32 lb. |
| Percentage of fat in the butter-milk | . | . | .55 |
| " " skim-milk | . | . | .3 |
| Melting-point of the butter | . | . | 90° Fahr. |
| Milk to 1 lb. of butter | . | . | 23.14 lb. |
| Total butter-fat available per 100 lb. of milk | . | . | 4.09 " |
| Fat recovered in the butter | . | 3.672 lb. ¹ | |
| " " butter-milk | . | .060 " | |
| " " skim-milk | . | .255 " | |
| Fat unaccounted for | . | .103 " | |
| | | | 4.09 " |

Percentage of fat in the milk recovered in the butter, 89.78.

Bean-meal 8 lb., and a little Italian. Fourth Week, ending 5th October.

| | | | Fat. Per cent. | Solids other than fats. Per cent. |
|-----------|---|---|-------------------|--------------------------------------|
| Cow No. 1 | . | . | 4.0 | 8.91 |
| " 2 | . | . | 4.2 | 8.95 |
| " 3b | . | . | 3.9 | 9.15 |
| " 4 | . | . | 3.75 | 8.72 |
| " 5 | . | . | 3.9 | 8.89 |
| Average | | | 3.95 | 8.92 |

¹ Assuming the butter to contain 85 per cent of pure fat.

| | | | | |
|--|---|---|---|------------------------|
| Butter per 100 lb. of milk | . | . | . | 4.297 lb. |
| Percentage of fat in the butter-milk | . | . | . | .2 |
| " " skim-milk | . | . | . | .25 |
| Melting-point of the butter | . | . | . | 90.5° Fahr. |
| Milk to 1 lb. of butter | . | . | . | 23.27 lb. |
| Total butter-fat available per 100 lb. of milk | . | . | . | 3.95 " |
| Fat recovered in the butter | . | . | . | 3.625 lb. ¹ |
| " " butter-milk | . | . | . | .030 " |
| " " skim-milk | . | . | . | .200 " |
| Fat unaccounted for | . | . | . | .095 " |
| | | | | <hr/> 3.95 " |

Percentage of butter-fat in the milk recovered in the butter, 92.4.

Average of the Third and Fourth Weeks, when the Cows were fed on Bean-meal.

| | Fat. Per cent. | Solids other than fats. Per cent. | |
|---|-------------------|--------------------------------------|--------------------|
| | 4.02 | 9.03 | |
| Butter per 100 lb. of milk | . | . | 4.308 lb. |
| Percentage of fat in the milk recovered in the butter | . | . | 91.09 ¹ |
| Percentage of fat in the butter-milk | . | . | .37 |
| Melting-point of the butter | . | . | 90.25° Fahr. |
| Milk to 1 lb. of butter | . | . | 23.20 lb. |

Milk.

The following quantities of milk were yielded during each week of this period:—

| | From five cows. lb. |
|---------------------------------|------------------------|
| 1st week | 700.5 |
| 2d " | 614.0 |
| 3d " | 559.0 |
| 4th " | 496.0 |
| Average of the 3d and 4th weeks | <hr/> 527.0 |

Although a newly calved cow (No. 5) was added at the beginning of this period, the milk of the cows previously under test continued to decrease so quickly in quantity, that at the end of the month the five cows had only produced about 1 gallon of milk more than the four had yielded in the previous month. Basing the yield on the same four cows which had been in use both months, it is found that when fed on bean-meal they fell off in total yield of milk $8\frac{1}{2}$ per cent from the yield of the previous month.

Butter and Butter-fat.

The butter made during this period was generally fairly firm, of moderate colour, and good flavour. The butter produced

¹ Assuming the butter to contain 85 per cent of pure fat.

during each week of this period from 100 lb. of milk was as follows:—

| | | | | | lb. |
|-----------|---|---|---|---|-------|
| 1st week. | . | . | . | . | 4.734 |
| 2d " | . | . | . | . | 4.164 |
| 3d " | . | . | . | . | 4.320 |
| 4th " | . | . | . | . | 4.297 |

The average weight of milk required to produce 1 lb. of butter was as follows:—

| | | | | | lb. |
|-----------|---|---|---|---|-------|
| 1st week. | . | . | . | . | 21.1 |
| 2d " | . | . | . | . | 24.0 |
| 3d " | . | . | . | . | 23.14 |
| 4th " | . | . | . | . | 23.27 |

If the average be taken of the four cows which have been used during the last two months, the gain in butter-fat by the use of bean-meal over maize and barley-meal is 11 per cent more in the first week with the former than it was in the last week with the latter. If the whole five cows are taken, the average gain in butter-fat is 18 per cent. From this point, however, the average per cent of fat in the milk gradually decreased, until at the end of the fourth week it stood $5\frac{1}{2}$ per cent above what it was during the corresponding week with the previous food.

During this period the average percentage of butter-fat in the milk of each week was as follows:—

| | | | | | |
|-----------|---|---|---|---|------|
| 1st week. | . | . | . | . | 4.4 |
| 2d " | . | . | . | . | 4.33 |
| 3d " | . | . | . | . | 4.09 |
| 4th " | . | . | . | . | 3.95 |

While the cows were fed on bean-meal the fat left in the butter-milk was very much less than when they had maize and barley-meal. The average fat in the butter-milk of the third and fourth weeks during the time when bean-meal was given to the cows was .37 per cent, while with the previous food (maize and barley-meal) it was 1.3 per cent during the corresponding weeks. During this period the average percentage of fat in the butter-milk of each week was as follows:—

| | | | | | |
|-----------|---|---|---|---|-----|
| 1st week. | . | . | . | . | .25 |
| 2d " | . | . | . | . | .25 |
| 3d " | . | . | . | . | .55 |
| 4th " | . | . | . | . | .2 |

The ripening and churning of each week was supposed to be identical with the others, but the results of the third week would almost seem to indicate that some irregularity had occurred in these processes.

The percentage of fat in the milk recovered in the butter during each week of this period was as follows:—

| | | | | | | |
|------------|---|---|---|---|---|-------|
| 1st week . | . | . | . | . | . | 91.4 |
| 2d " . | . | . | . | . | . | 82.0 |
| 3d " . | . | . | . | . | . | 89.78 |
| 4th " . | . | . | . | . | . | 92.4 |

During the second week of this period the separated milk was not sampled every afternoon; and as a small part of the separator was slightly out of repair, it may have happened that the separating was not thoroughly done, and a portion of the fat may have gone amissing there, which may account for the relatively small percentage of fat recovered as butter during this week. The repair was attended to, and arrangements made for taking a sample of each day's skim-milk in order to guard against such source of doubt in the future.

The melting-point of the butter made during each week of this period was as follows:—

| | | | | | |
|------------|---|---|---|---|-------|
| | | | | | Fahr. |
| 1st week . | . | . | . | . | 92° |
| 2d " . | . | . | . | . | 90° |
| 3d " . | . | . | . | . | 90° |
| 4th " . | . | . | . | . | 90.5° |

Solids other than Fats.

During the time that the cows were fed on bean-meal the solids other than fats, like the fats themselves, gradually decreased from the beginning to the end. The percentages for each week were as follows:—

| | | | | | |
|------------|---|---|---|---|------|
| 1st week . | . | . | . | . | 9.73 |
| 2d " . | . | . | . | . | 9.63 |
| 3d " . | . | . | . | . | 9.14 |
| 4th " . | . | . | . | . | 8.92 |

A nitrogenous food like bean-meal has usually been considered as likely to increase the solids other than fats; and although on this occasion it did so in a very marked degree for the first two weeks, the tendency after that seemed to be to run back to about the normal. In several of the previous periods it appeared as if more uniform results might be obtained if the food were continued for five weeks instead of four. Arrangements were therefore made for doing so in future.

PERIOD VI.

Paisley Meal 8 lb., and sufficient Italian Grass to keep the Cows in good health.

The use of this food began on the 6th October. This meal is largely made at Paisley, hence its name. It is ground Indian corn from which a portion of its starch has been abstracted in the manufacture of corn-flour and starch. Cow 4b was substituted for cow 4 at the beginning of this period. At that time she had been calved about three weeks.

Up till about fifteen years ago this food had a sour unpleasant smell, and was principally used for pig-feeding. In recent years, however, the unpleasant flavour has been entirely got rid of; and as it contains a much larger percentage of albuminoids than the Indian corn from which it is made, it has been considered by many a cheap food, and has come to be largely used for cows. But while some dairymen recommend it very highly, others—particularly butter-makers—give it a very bad name.

Live-weights of the Cows.

| | 5th and 7th Oct. lb. | 9th and 11th Nov. lb. | Difference. lb. |
|-------------------------|-------------------------|--------------------------|--------------------|
| Cow No. 1 . . . | 906 | 923 | 17+ |
| " 2 . . . | 798 | 840 | 42+ |
| " 3b . . . | 840 | 856 | 16+ |
| " 4b ¹ . . . | 840 | 780 | 60- |
| " 5 . . . | 783 | 827 | 44+ |

Paisley Meal and a little Italian Grass. Fourth Week, ending 2d November.

| | Fat Per cent. | Solids other than fats. Per cent. |
|--|------------------|--------------------------------------|
| Cow No. 1 | 4.0 | 9.56 |
| " 2 | 4.5 | 9.28 |
| " 3 | 3.8 | 9.52 |
| " 4 | 5.0 | 9.12 |
| " 5 | 4.0 | 9.04 |
| Average | 4.26 | 9.30 |
| Butter per 100 lb. of milk | | 4.518 lb. |
| Percentage of fat in the butter-milk | | 2.5 |
| " " skin-milk | | .25 |
| Melting-point of the butter | | 87° Fahr. |
| Milk to 1 lb. of butter | | 22.0 lb. |
| Percentage of pure fat in the butter | | 81.25 |
| Total butter-fat available per 100 lb. of milk | | 4.26 lb. |
| Fat recovered in the butter | 3.671 lb. | |
| " " butter-milk | .425 " | |
| " " skim-milk | .196 " | |
| Fat unaccounted for (in excess) | ... | .032 " |
| | <u>4.292 lb.</u> | <u>4.292 lb.</u> |

Percentage of fat in the milk recovered in the butter, 86.2.

¹ During the whole of this period, unless a few days at the beginning, cow No. 4b was more or less afflicted with hoven, and ultimately had to be rejected at the end as incurable.

Paisley Meal and a little Italian Grass. Fifth Week, ending 9th November.

| Cow No. | | Fat. Per cent. | Solids other than fats. Per cent. |
|--|---------------|-------------------|--------------------------------------|
| | | | |
| 1 | . | 3.7 | 8.84 |
| " 2 | . | 4.5 | 9.28 |
| " 3 | . | 3.8 | 9.13 |
| " 4 | . | 4.0 | 9.04 |
| " 5 | . | 4.35 | 9.04 |
| Average | | 4.05 | 9.06 |
| Butter per 100 lb. of milk | | . | 4.445 lb. |
| Percentage of fat in the butter-milk | | . | 1.1 |
| " " skim-milk | | . | .25 |
| Melting-point of the butter | | . | 87° Fahr. |
| Percentage of pure fat in the butter | | . | 82.5 |
| Milk to 1 lb. of butter | | . | 22.49 lb. |
| Total butter-fat available per 100 lb. of milk | | . | 4.05 " |
| Fat recovered in the butter | | 3.667 lb. | |
| " | " butter-milk | .187 " | |
| " | " skim-milk | .196 " | |
| | | 4.05 lb. | 4.05 lb. |

Percentage of fat in the milk recovered in the butter, 90.5.

Average of the Fourth and Fifth Weeks when the Cows were fed on 8 lb. of Paisley Meal and a little Italian Grass.

| | Fat. Per cent. | Solids other than fats. Per cent. |
|---|-------------------|--------------------------------------|
| | | |
| | 4.15 | 9.18 |
| Butter per 100 lb. of milk | . | 4.481 lb. |
| Percentage of fat in the milk recovered in the butter | . | 88.35 |
| Percentage of fat in the butter-milk | . | 1.8 |
| " " skim-milk | . | .25 |
| Melting-point of the butter | . | 87° Fahr. |
| Percentage of pure fat in the butter | . | 81.75 |
| Milk to 1 lb. of butter | . | 22.24 lb. |

Milk.

During this period the following quantities of milk were yielded during each week:—

| | | By five cows. |
|----------------------------------|---|---------------|
| | | lb. |
| 1st week | . | 547 |
| 2d " | . | 510 |
| 3d " | . | 465 |
| 4th " | . | 424 |
| 5th " | . | 400 |
| Average of the 4th and 5th weeks | | 412 |

For the first four weeks when Paisley meal was used, the yield of milk was fully 20 per cent less than in the previous

period. One of these cows was, however, obviously unwell, and rejecting it, the fall is 13·8 per cent, which is still very considerable.

Butter and Butter-fat.

During the whole time that this food was used the butter was of a particularly porous texture (locally called "fozy"), very soft, devoid of colour or flavour, but had no particularly bad taste or smell. During this period also the water in the butter seemed to be above the average. On one occasion a portion of it was worked for more than the usual time in order to see if the apparent excess of water could be reduced, but without making much material alteration on it. If well done, a moderate amount of working seems quite sufficient to expel all superfluous water, while extra working will only break the grain, make the butter have a greasy appearance, and have little effect in freeing it from extra water.

The fat available in the milk was not sufficient to account for the amount found in the products, unless on the supposition that more water than usual was retained in the butter. Having failed to prove this by extra working of the butter, it was considered advisable to determine the true fat it contained. The results obtained showed that the percentage of pure fat in the butter varied considerably from the generally accepted average—viz., 85 per cent—and therefore the butter made during the remaining periods was always tested in this way. Moreover, when the percentage of fat has been determined in the butter as well as in the butter-milk and skim-milk, we can compare the total fat in the milk with that found in these products, and thus obtain a most valuable check on our most important data.

The pure fat in the butter was found for only the fourth and fifth weeks of this period, with the result as previously stated.

When bean-meal was given to the cows, the average percentage of butter-fat in the milk of the last two weeks was 4·02, while during the corresponding weeks of this period it was 4·15 per cent. During this period the percentage of butter-fat in the milk of each week was as follows:—

| | | | | | | |
|----------|---|---|---|---|---|------|
| 1st week | . | . | . | . | . | 4·11 |
| 2d " | . | . | . | . | . | 4·43 |
| 3d " | . | . | . | . | . | 4·38 |
| 4th " | . | . | . | . | . | 4·26 |
| 5th " | . | . | . | . | . | 4·05 |

The milk of this period and that of the previous one may

therefore be looked on as almost identical as far as butter-fat is concerned. There, however, the similarity ends.

During the third and fourth weeks when bean-meal was used the average butter produced per 100 lb. of milk was 4·308 lb., while in the fourth and fifth weeks that Paisley meal was given to the cows it was 4·481 lb., or a seeming gain of ·173 lb. (2½ ounces) in favour of Paisley meal.

The one butter—that from the bean-meal—was firm and of good flavour, and the other porous, soft, and altogether of a lower quality. The former was not tested for pure butter-fat, but judging from its appearance and from the fat left in the butter and skim milk, I believe it to have contained less than the normal amount (15 per cent) of water, while that from the use of Paisley meal was found by analysis to contain only 81·75 of pure fat, or from 18 to 19 per cent of water.

In the former case the percentage of butter-fat recovered in the butter was 91·09 at the very least, and probably more, while with the latter food it was 88·35. The percentage recovered each week was as follows:—

| | |
|--------------------|-------------------|
| 1st week | 83·8 ¹ |
| 2d " | 83·9 ¹ |
| 3d " | 87·7 ¹ |
| 4th " | 86·2 |
| 5th " | 90·5 |

The average weight of butter produced each week during this period, per 100 lb. of milk, was as follows:—

| | |
|--------------------|-------|
| | lb. |
| 1st week | 4·057 |
| 2d " | 4·375 |
| 3d " | 4·519 |
| 4th " | 4·518 |
| 5th " | 4·445 |

The average amount of milk required to produce 1 lb. of butter was as follows:—

| | |
|--------------------|-------|
| | lb. |
| 1st week | 24·6 |
| 2d " | 22·85 |
| 3d " | 22·13 |
| 4th " | 22·22 |
| 5th " | 22·49 |

When bean-meal was used the amount of butter-fat left in the butter-milk during the third and fourth weeks was ·37 per cent, while during this period it was 1·8 per cent during the fourth and fifth weeks. It is also worthy of notice that when maize and barley-meal were used the butter-milk contained 1·35

¹ The calculations for these weeks are on the basis of the butter containing 85 per cent of pure fat. The others are as actually determined.

per cent of butter-fat. The following are the percentages of butter-fat found in the milk of each week:—

| | |
|----------|-----------------|
| 1st week | 1 6 |
| 2d " | 8 |
| 3d " | 9 |
| 4th " | 25 ¹ |
| 5th " | 1.1 |

The melting-point of the butter produced while the cows were fed on Paisley meal is worthy of notice. During the fourth and fifth weeks of this period the average melting-point of the butter was 87° Fahr., while when bean-meal was used it was 90° Fahr. for the third week, and 90.5° Fahr. for the fourth week. Leaving other effects out of account, this difference in melting is very great indeed, and while not objectionable in the winter production of butter, this tendency of Paisley meal would be fatal to its use in a butter-dairy during warm weather. The following are the melting-points of the butter of each week during this period:—

| | |
|--------------------|-------|
| | Fahr. |
| 1st week | 91° |
| 2d " | 89° |
| 3d " | 88° |
| 4th " | 87° |
| 5th " | 87° |

It is interesting to note that the butter of the first week had a somewhat higher melting-point than that of the last week when bean-meal was used; and it will be also noticed that much the same effect was produced during the first week when bean-meal was used.

The melting-point of the butter produced by the consumption of Indian meal and barley-meal was 92.25° Fahr., and it is interesting to compare this with the melting-point—87° Fahr.—of the butter during the last two weeks when Paisley meal was used. Highly nitrogenous foods are often supposed to have a tendency to harden butter; but here is a case of Paisley meal, which is much more nitrogenous than Indian corn, from which it is produced, having had the effect of softening the butter. The question then arises, Is this brought about by the simple abstraction of the starch, or by some other process in the course of manufacture? In the conversion of Indian corn and barley into distillers' or brewers' grains (draff), a somewhat similar change in the original constituents of the grain is brought about as happens in the conversion of maize into Paisley meal, and also with the same effect of lowering the melting-point of the butter from milk produced by their consumption. Whether

¹ Owing to miscalculation of the temperature of the air, the churning this week was probably at fully too high a temperature.

or not this is only a coincidence I am unable to say, but the point might advantageously be kept in view by investigators in the future.

Solids other than Fats.

During the time that Paisley meal was fed to the cows the solids other than fats remained about the normal. In the second week this food was used they fell considerably, but recovered immediately after, and remained very uniform till the end. The average percentage of solids other than fats of each week was as follows:—

| | | | | | | | |
|----------|---|---|---|---|---|---|------|
| 1st week | . | . | . | . | . | . | 9.01 |
| 2d " | . | . | . | . | . | . | 8.85 |
| 3d " | . | . | . | . | . | . | 9.25 |
| 4th " | . | . | . | . | . | . | 9.30 |
| 5th " | . | . | . | . | . | . | 9.06 |

The tendency at the end of the period for the milk to revert to almost normal conditions presents itself here again, as it has done on several previous occasions.

PERIOD VII.

15 lb. Oats bruised and a little second-cut Hay with a few Cabbages.

The use of this food began on 10th November, and was continued for five weeks. Cow 4b having been more or less affected with hoven during the whole of last month, was withdrawn and cow 4c put in her place. At the time 4c was added she had been calved ten days. The oats used were thoroughly crushed by rolling, and before being fed to the animals they were mixed with a little chaff, after which hot water was poured over them. The cows were fed with the mixture three times daily in a sloppy condition and a little above blood-heat.

Live-weights.

| | | 11th Nov. lb. | 14th and 16th Dec. lb. | Difference. lb. |
|-----------|---|------------------|---------------------------|--------------------|
| Cow No. 1 | . | 923 | 938 | 15+ |
| " 2 | . | 840 | 861 | 21+ |
| " 3b | . | 856 | 889 | 33+ |
| " 4c | . | ... | 833 | ... |
| " 5 | . | 827 | 847 | 20+ |
| " 6 | . | ... | 946 | ... |

The gains in live-weight are fairly regular, and about what

usually occur from moderate and judicious feeding of average milking cows a few months after calving.

Bruised Oats and Hay. Third Week.

| Cow No. | | Fat. Per cent. | Solids other than fats | |
|---|---|-------------------|------------------------|-----------------|
| | | | Per cent. | |
| 1 | . | 4.0 | 8.65 | |
| " 2 | . | 4.3 | 9.10 | |
| " 3 <i>b</i> | . | 4.0 | 8.91 | |
| " 4 <i>c</i> | . | 5.0 | 8.90 | |
| " 5 | . | 4.8 | 9.08 | |
| Average | | <u>4.42</u> | <u>8.93</u> | |
| Butter per 100 lb. of milk | | . | 4.638 | lb. |
| Percentage of fat in the butter-milk | | . | .4 | |
| " " skim-milk | | . | .25 | |
| Melting-point of the butter | | . | 92° | Fahr. |
| Milk to 1 lb. of butter | | . | 21.6 | lb. |
| Percentage of fat in the butter | | . | 87.0 | |
| Total fat available per 100 lb. of milk | | . | 4.42 | lb. |
| Fat recovered in the butter | | 4.035 | lb. | |
| " " butter-milk | | .104 | " | |
| " " skim-milk | | .175 | " | |
| Fat unaccounted for | | .106 | " | |
| | | <u>4.42</u> | <u>lb.</u> | <u>4.42 lb.</u> |

Percentage of fat in the milk recovered in the butter, 91.3.

Bruised Oats and Hay. Fourth Week.

| Cow No. | | Fat Per cent | Solids other than fats. | |
|---|---|-----------------|-------------------------|------------------|
| | | | Per cent. | |
| 1 | . | 4.0 | 8.38 | |
| " 2 | . | 4.0 | 9.17 | |
| " 3 <i>b</i> | . | 4.2 | 9.00 | |
| " 4 <i>c</i> | . | 4.65 | 9.05 | |
| " 5 | . | 4.5 | 8.88 | |
| Average | | <u>4.275</u> | <u>8.89</u> | |
| Butter per 100 lb. of milk | | . | 4.89 | lb. |
| Percentage of fat in the butter-milk | | . | .2 | |
| " " skim-milk | | . | .2 | |
| Melting-point of the butter | | . | 91° | Fahr. |
| Milk to 1 lb. of butter | | . | 20.5 | lb. |
| Percentage of fat in the butter | | . | 84.7 | |
| Total fat available per 100 lb. of milk | | . | 4.275 | lb. |
| Fat recovered in the butter | | 4.142 | lb. | |
| " " butter-milk | | .030 | " | |
| " " skim-milk | | .160 | " | |
| Fat unaccounted for in excess | | ... | .057 | " |
| | | <u>4.332</u> | <u>lb.</u> | <u>4.332 lb.</u> |

Percentage of fat in the milk recovered in the butter, 96.8.

Bruised Oats and Hay. Fifth Week.

| Cow No. | | Fat. Per cent. | Solids other than fats. Per cent. |
|--|---|-------------------|--------------------------------------|
| | | | |
| Cow No. 1 | . | 3.9 | ... ¹ |
| " 2 | . | 4.2 | ... |
| " 3b | . | 4.5 | ... |
| " 4c | . | 4.2 | ... |
| " 5 | . | 4.5 | ... |
| Average | | 4.26 | ... |
| | | | |
| Butter per 100 lb. of milk | . | . | 4.65 lb. |
| Percentage of fat in the butter-milk | . | . | .35 |
| " " skim-milk | . | . | .3 |
| Melting-point of the butter | . | . | 90.5° Fahr. |
| Milk to 1 lb. of butter | . | . | 21.5 lb. |
| Percentage of pure fat in the butter | . | . | .83 |
| Total butter-fat available per 100 lb. of milk | . | . | 4.26 lb. |
| Fat recovered in the butter | . | 3.859 lb. | |
| " " butter-milk | . | .052 " | |
| " " skim-milk | . | .240 " | |
| Fat unaccounted for | . | .109 " | |
| | | 4.26 lb. | 4.26 lb. |

Percentage of fat in the milk recovered in the butter, 90.6.

Average of last two Weeks when Oats were used.

| | Fat. Per cent. | Solids other than fats. Per cent. |
|--|-------------------|--------------------------------------|
| | | |
| | 4.267 | 8.88 ² |
| Butter per 100 lb. of milk | . | 4.721 lb. |
| Percentage of butter-fat recovered in the butter | . | 93.7 |
| " " butter-milk | . | .27 |
| " " skim-milk | . | .25 |
| Melting-point of the butter | . | 90.75° Fahr. |
| Percentage of pure fat in the butter | . | 83.8 |
| Milk to 1 lb. of butter | . | 21.0 lb. |

Milk.

For this and the two following periods the milk record was accidentally destroyed.

Butter and Butter-fat.

The butter produced during the time that oats were fed to the cows was much firmer and more solid in the very first week than it had been for a long time, while the flavour and texture were all that could be desired. In the second week the firmness was more marked, while the quantity was also considerably greater. From this time, however, the quantity began to de-

¹ Results lost.

² Average of the third and fourth weeks.

crease, while the firmness became less marked, but the soft spongy butter produced during the time Paisley meal was used had entirely disappeared. The average butter-fat for the fourth and fifth week during the time the previous food was used was 4.15 per cent, while with oats it was 4.17 per cent. The average percentage of butter-fat in the milk of each week was as follows:—

| | | | | | | |
|----------|---|---|---|---|---|-------|
| 1st week | . | . | . | . | . | 4.24 |
| 2d " | . | . | . | . | . | 4.49 |
| 3d " | . | . | . | . | . | 4.42 |
| 4th " | . | . | . | . | . | 4.275 |
| 5th " | . | . | . | . | . | 4.26 |

The percentage of fat in the milk recovered in the butter during this period was as follows:—

| | | | | | | |
|----------|---|---|---|---|---|------|
| 1st week | . | . | . | . | . | 98.7 |
| 2d " | . | . | . | . | . | 97.4 |
| 3d " | . | . | . | . | . | 91.3 |
| 4th " | . | . | . | . | . | 96.8 |
| 5th " | . | . | . | . | . | 90.6 |

The butter produced per 100 lb. of milk during the fourth and fifth weeks when Paisley meal was used was 4.481 lb., while during the corresponding weeks with oats it was 4.46 lb.

The butter yielded during this period per 100 lb. of milk was as follows:—

| | | | | | | |
|----------|---|---|---|---|---|-------|
| | | | | | | lb. |
| 1st week | . | . | . | . | . | 4.717 |
| 2d " | . | . | . | . | . | 4.916 |
| 3d " | . | . | . | . | . | 4.638 |
| 4th " | . | . | . | . | . | 4.89 |
| 5th " | . | . | . | . | . | 4.65 |

The milk required to produce 1 lb. of butter was as follows:—

| | | | | | | |
|----------|---|---|---|---|---|------|
| | | | | | | lb. |
| 1st week | . | . | . | . | . | 21.2 |
| 2d " | . | . | . | . | . | 20.3 |
| 3d " | . | . | . | . | . | 21.6 |
| 4th " | . | . | . | . | . | 20.5 |
| 5th " | . | . | . | . | . | 21.5 |

While, however, the butter made from the consumption of Paisley meal contained only 81.8 per cent of pure butter-fat, that from the consumption of oats contained 83.8 per cent of pure butter-fat. It is a very noticeable fact, and one which has continuously been repeated during these investigations, that the gain in percentage of pure fat in the butter is slightly under 2½ per cent between what is called a bad butter-food and a good one.

The percentage of pure fat in the butter of each week was as follows:—

| | | | | | | |
|----------|---|---|---|---|---|------|
| 1st week | . | . | . | . | . | 89.0 |
| 2d " | . | . | . | . | . | 89.0 |
| 3d " | . | . | . | . | . | 85.0 |
| 4th " | . | . | . | . | . | 84.7 |
| 5th " | . | . | . | . | . | 83.0 |

The percentage of pure butter-fat recovered in the butter when the previous food was used was 88.35 per cent, while with oats during the corresponding weeks it was 93.7 per cent.

With the previous food the fat left in the butter-milk was 1.8 per cent, while during the corresponding time that oats were fed to the cows it was .27 per cent. During the first and second weeks it was even less, there being only a mere trace in the second week. Here again the best results are recorded in the second week, and had the test been then stopped there would have been all the appearances of a very much greater gain than ultimately was the case. The facts, however, brought out as above in regard to the relative "churnability" of the butter-fat tend to reconcile the popular opinion that certain foods materially increase the butter yield, with that of most experimentalists that the gain is much less than is generally supposed. Here we not only have at first a material gain in quantity and quality of butter-fat, but with one food a very large percentage of the fat has been left in the butter milk, while with the other a very small amount has been left in it.

The mean melting-point of the butter during the fourth and fifth weeks while the previous food was used was 87° Fahr., while during the corresponding period with oats it was 90.75° Fahr. Strange to say, the melting-point also decreased after the second week, the results being as follows:—

| | | | | | |
|----------|---|---|---|---|--------|
| | | | | | Fahr. |
| 1st week | . | . | . | . | 90.5° |
| 2d " | . | . | . | . | 92.25° |
| 3d " | . | . | . | . | 92° |
| 4th " | . | . | . | . | 91° |
| 5th " | . | . | . | . | 90.5° |

Solids other than Fats.

The following are the percentages of solids other than fats during the first four weeks of this period:—

| | | | | | |
|----------|---|---|---|---|------|
| 1st week | . | . | . | . | 9.04 |
| 2d " | . | . | . | . | 9.22 |
| 3d " | . | . | . | . | 8.91 |
| 4th " | . | . | . | . | 8.88 |
| 5th " | . | . | . | . | ... |

Unfortunately I was unable to take the specific gravity of the samples for the fifth week. As was the case with the butter, melting-point, and fat in the butter, it will be seen that the solids other than fats decreased from the second week.

PERIOD VIII.

Linseed-cake with sufficient second-cut Hay to keep the Cows in health.

The use of this food began on 15th December. The cake used came from the River Plate, South America, was lightly pressed, seemed fairly pure, and contained from 13 to 15 per cent of oil; but it was not pleasing to look at, as considerable quantities of fibre and strings were sticking to the outside of almost every other cake. During the first week each cow did not consume over 5 lb. daily, but in the second week the average was about 6 lb., while that of the third, fourth, and fifth weeks it was 7 lb. daily for each animal. The bulk of the cake was given in the form of meal, mixed with a little chaff and some hot water. Cow No. 6 was added to the number of experimental cows at the beginning of this period. She was about ten days calved at that time.

Linseed-cake 7 lb., and second-cut Italian Hay. Fourth Week.

| Cow No. | 1 | 2 | 3 | 4 | 5 | 6 | Average | Fat. Per cent. | Solids other than fats. Per cent. |
|-----------|---|---|---|---|---|---|---------|-------------------|--------------------------------------|
| | | | | | | | | | |
| Cow No. 1 | . | . | . | . | . | . | . | 3.6 | 8.90 |
| " 2 | . | . | . | . | . | . | . | 4.3 | 8.97 |
| " 3 | . | . | . | . | . | . | . | 4.1 | 8.93 |
| " 4 | . | . | . | . | . | . | . | 4.1 | 9.06 |
| " 5 | . | . | . | . | . | . | . | 4.1 | 9.19 |
| " 6 | . | . | . | . | . | . | . | 4.3 | 8.84 |
| Average | | | | | | | | 4.08 | 8.98 |

| | | | |
|--|---|----------|-----------|
| Butter per 100 lb. of milk | . | . | 4.67 lb. |
| Percentage of fat in the butter-milk | . | . | 1.1 |
| " " " skim-milk | . | . | .25 |
| Melting-point of the butter | . | . | 95° Fahr. |
| Percentage of pure fat in the butter | . | . | 81.25 |
| Milk to 1 lb. of butter | . | . | 21.41 lb. |
| Total available fat in 100 lb. of milk | . | . | 4.08 " |
| Fat recovered in the butter | . | 3.79 lb. | |
| " " butter-milk | . | .11 " | |
| " " skim-milk | . | .21 " | |
| Fat unaccounted for (excess) | . | ... | .03 |
| | | 4.11 lb. | 4.11 lb. |

Percentage of fat in the milk recovered in the butter, 92.4.

Linseed-cake 7 lb., and second-cut Italian Hay. Fifth Week.

| Cow No. | | | | | Fat | Solids other than fats |
|---|---|---|---|---|-----------|------------------------|
| | | | | | Per cent. | Per cent. |
| Cow No. 1 | . | . | . | . | 3.5 | 9.33 |
| " 2 | . | . | . | . | 4.0 | 9.83 |
| " 3 | . | . | . | . | 4.1 | 9.59 |
| " 4 | . | . | . | . | 3.9 | 9.28 |
| " 5 | . | . | . | . | 4.0 | 9.43 |
| " 6 | . | . | . | . | 4.6 | 9.69 |
| Average | | | | | 4.02 | 9.52 |
| Butter per 100 lb. of milk | | | | | . | 4.5 lb. |
| Percentage of fat in the butter-milk | | | | | . | .75 |
| " " " skim-milk | | | | | . | .25 |
| Melting-point of the butter | | | | | . | 95° Fahr. |
| Percentage of pure fat in the butter | | | | | . | 84.0 |
| Milk to 1 lb. of butter | | | | | . | 22.2 lb. |
| Total available fat per 100 lb. of milk | | | | | . | 4.02 " |
| Fat recovered in the butter | | | | | 3.78 lb. | |
| Fat contained in the butter-milk | | | | | .07 " | |
| " " skim-milk | | | | | .21 " | |
| Fat unaccounted for in excess | | | | | ... | .04 " |
| | | | | | 4.06 lb. | 4.06 lb. |

Percentage of fat in the milk recovered in the butter, 94.0.

Average of the Fourth and Fifth Weeks when 7 lb. of Linseed-cake was fed daily to each Cow.

| | Fat | Solids other than fats. |
|--------------------------------------|----------|-------------------------|
| | Per cent | Per cent. |
| | 4.05 | 9.25 |
| Butter per 100 lb. of milk | . | 4.585 lb. |
| Percentage of fat in the butter-milk | . | .92 |
| " " " milk recovered in the butter | . | 93.2 |
| Melting-point of the butter | . | 95° Fahr. |
| Percentage of pure fat in the butter | . | 82.62 |
| Milk to 1 lb. of butter | . | 21.8 lb. |

Live-weights of the Cows.

| Cow No. | | 14th and 16th Dec. | 18th and 20th Jan. | Difference. |
|-----------|---|--------------------|--------------------|-------------|
| | | lb. | lb. | lb. |
| Cow No. 1 | . | 938 | 969 | 31 + |
| " 2 | . | 861 | 904 | 43 + |
| " 3b | . | 889 | 920 | 31 + |
| " 4c | . | 833 | 812 | 21 - |
| " 5 | . | 847 | 810 | 37 - |
| " 6 | . | 946 | 847 | 99 - |

Butter and Butter-fat.

The butter produced during this period was soft and open in texture, and on each occasion went rancid, or at least off flavour within a few days after being made. The quality was

decidedly the worst made during these investigations, and certainly no other butter showed a taint so quickly. The average percentage of fat in the milk of each week during this period was as follows:—

| | | | | | | |
|------------|---|---|---|---|---|------|
| 1st week . | . | . | . | . | . | ... |
| 2d " . | . | . | . | . | . | 4·85 |
| 3d " . | . | . | . | . | . | 4·23 |
| 4th " . | . | . | . | . | . | 4·08 |
| 5th " . | . | . | . | . | . | 4·02 |

Although each animal was receiving almost 1 lb. of pure fat daily in the cake alone, yet from the second week the percentage of fat in the milk gradually decreased in spite of the increased quantity given in the food. As on previous occasions, it is very noticeable that the maximum percentage of fat was reached during the second week. Owing to an accident the fat, and solids other than fats, in the milk, were not found for the first week.

During this period the average weight of butter produced each week per 100 lb. of milk was as follows:—

| | | | | | | |
|------------|---|---|---|---|---|------|
| | | | | | | lb. |
| 1st week . | . | . | . | . | . | 5·1 |
| 2d " . | . | . | . | . | . | 5·72 |
| 3d " . | . | . | . | . | . | 5·02 |
| 4th " . | . | . | . | . | . | 4·67 |
| 5th " . | . | . | . | . | . | 4·50 |

The following weights of milk were required to produce 1 lb. of butter:—

| | | | | | | |
|------------|---|---|---|---|---|------|
| | | | | | | lb. |
| 1st week . | . | . | . | . | . | 19·6 |
| 2d " . | . | . | . | . | . | 17·3 |
| 3d " . | . | . | . | . | . | 19·9 |
| 4th " . | . | . | . | . | . | 21·4 |
| 5th " . | . | . | . | . | . | 22·2 |

The butter produced during the time that the cows were fed on linseed-cake was greater in weight than on any previous occasion, although the percentage of fat in the milk did not materially differ from what it had been previously. The gain was however more apparent than real, as the percentage of pure fat in the butter was much less than average butter is usually supposed to contain. The average percentage of pure fat in the butter of each week was as follows:—

| | | | | | | |
|------------|---|---|---|---|---|-------|
| 1st week . | . | . | . | . | . | 80·2 |
| 2d " . | . | . | . | . | . | 77·5 |
| 3d " . | . | . | . | . | . | 78·0 |
| 4th " . | . | . | . | . | . | 81·25 |
| 5th " . | . | . | . | . | . | 84·0 |

During this period the percentage of fat in the milk which

was recovered in the butter was very high, the amount for each week being as follows:—

| | | | | | | |
|-----------------------|---|---|---|---|---|------|
| 1st week ¹ | . | . | . | . | . | ... |
| 2d " | . | . | . | . | . | 91·4 |
| 3d " | . | . | . | . | . | 92·5 |
| 4th " | . | . | . | . | . | 92·4 |
| 5th " | . | . | . | . | . | 94·0 |

The melting-point of the butter was as follows:—

| | | | | | | |
|-----------------------|---|---|---|---|---|-----|
| 1st week ¹ | . | . | . | . | . | ... |
| 2d " | . | . | . | . | . | 95° |
| 3d " | . | . | . | . | . | 97° |
| 4th " | . | . | . | . | . | 95° |
| 5th " | . | . | . | . | . | 95° |

As a rule, the melting-point of the butter very fairly indicated its firmness up till the time that the cows were fed on linseed-cake, but during this period they did not correspond on any occasion. The butter was always open, porous, and soft, while the melting-points were the highest yet found. It may be that this cream was churned warmer than was necessary, but in order to have the tests uniform the same temperature—57° Fahr. to 58° Fahr.—was maintained throughout. Some dairymen maintain that the cream from certain foods is more easily churned than that from others, and if this cream would have churned at a lower temperature the butter might have been somewhat firmer, and its solidity and melting-point might have corresponded to each other more closely than they did. As it was, however, the melting-points of this butter are not a criterion by which it can be compared with the butters produced from the previous foods.

The percentage of fat left in the butter-milk during this period was as follows:—

| | | | | | | |
|-------------------|---|---|---|---|---|------|
| 1st week. | . | . | . | . | . | 1·65 |
| 2d " ² | . | . | . | . | . | ... |
| 3d " | . | . | . | . | . | 1·5 |
| 4th " | . | . | . | . | . | 1·1 |
| 5th " | . | . | . | . | . | ·75 |

The amount of fat left in the butter-milk is high; it is not higher, however, than that from the use of several other foods.

Solids other than Fats.

The solids other than fats in the milk were high during the most of this period. During the fourth week they fell considerably from some unknown cause, but again went as far up

¹ Results lost.

² Figures lost.

the week following. For each week the percentage of solids other than fats was as follows:—

| | | | | | | |
|-----------------------|---|---|---|---|---|------|
| 1st week ¹ | . | . | . | . | . | ... |
| 2d " | . | . | . | . | . | 9·61 |
| 3d " | . | . | . | . | . | 9·36 |
| 4th " | . | . | . | . | . | 8·98 |
| 5th " | . | . | . | . | . | 9·52 |

PERIOD IX.

Decorticated Cotton-seed-cake 7 lb., with about 1 lb. each of Bran and Treacle, 14 lb. of Potatoes, and second-cut Italian Hay.

The use of this food began on 19th January 1896, and at the beginning of this period cows Nos. 1, 2, and 3*b* were rejected and Nos. 1*b*, 2*b*, and 3*c* substituted for them. The cake was used in the form of meal, which had been ground at home from fresh cake, and before being fed to the animals was mixed with a little wheat-chaff, bran, treacle, and hot water.

Live-weights of the Animals.

| | 18th and 20th Jan. lb. | 22d and 24th Feb. lb. | Difference. lb. |
|--------------------------|---------------------------|--------------------------|--------------------|
| Cow No. 1 <i>b</i> . . . | 1023 | 1068 | 45 + |
| " 2 <i>b</i> . . . | 931 | 987 | 56 + |
| " 3 <i>c</i> . . . | 920 | 958 | 38 + |
| " 4 <i>c</i> . . . | 812 | 859 | 47 + |
| " 5 . . . | 810 | 846 | 36 + |
| " 6 . . . | 840 | 905 | 65 + |

Decorticated Cotton-cake 7 lb. Fourth Week.

| | Fat. Per cent. | Solids other than fats. Per cent. | |
|---|-------------------|--------------------------------------|-----------------|
| | 5·0 | 9·52 | |
| Butter per 100 lb. of milk . . . | | | 5·42 lb. |
| Percentage of fat in the butter-milk . . . | | | ·17 |
| " " skim-milk . . . | | | ·25 |
| Melting-point of the butter . . . | | | 106° Fahr. |
| Percentage of pure fat in the butter . . . | | | 84·0 |
| Milk to 1 lb. of butter . . . | | | 18·45 lb. |
| Total fat available per 100 lb. of milk . . . | | | 5·00 " |
| Fat recovered in the butter . . . | | 4·55 lb. | |
| " " butter-milk . . . | | ·02 " | |
| " " skim-milk . . . | | ·21 " | |
| Fat unaccounted for . . . | | ·22 " | |
| | | <u>5·00 lb.</u> | <u>5·00 lb.</u> |

Percentage of fat in the milk recovered in the butter, 91·04.

¹ Figures lost.

Decorticated Cotton-cake 7 lb. Fifth Week.

| Fat. Per cent. | Solids other than fats. Per cent. | |
|---|--------------------------------------|----------------|
| 4.75 | 9.33 | |
| Butter per 100 lb. of milk | . | 5.1 lb. |
| Percentage of fat in the butter-milk | . | trace only. |
| " " skim-milk | . | .15 |
| Melting-point of the butter | . | 103° Fahr. |
| Percentage of pure fat in the butter | . | 85.0 |
| Milk to 1 lb. of butter | . | 19.6 lb. |
| Total fat available per 100 lb. of milk | . | 4.75 " |
| Fat recovered in the butter | 4.33 lb. | |
| " " butter-milk | .00 " | |
| " " skim-milk | .13 " | |
| Fat unaccounted for | .29 " | |
| | <hr/> 4.75 lb. | <hr/> 4.75 lb. |

Percentage of fat in the milk recovered in the butter, 91.26.

From this forward each cow's milk was not tested separately, but as before a sample was taken from each every night, and all mixed together. At the end of the week the analysis was made from the composite sample, the average of these being considered as the quality of that week.

Average of the fourth and fifth weeks when decorticated cotton-seed-cake was used to the extent of 7 lb. daily:—

| Fat. Per cent. | Solids other than fats Per cent | |
|--------------------------------------|------------------------------------|--------------|
| 4.87 | 9.42 | |
| Butter per 100 lb. of milk | . | 5.26 lb. |
| Percentage of fat in the butter-milk | . | .08 |
| " " milk recovered in the butter | . | 91.15 |
| Melting-point of the butter | . | 104.5° Fahr. |
| Percentage of pure fat in the butter | . | 84.5 |
| Milk to 1 lb. of butter | . | 19.02 lb. |

Milk.

The quantity of milk produced during this period was large, being about 30 lb. per day for cows No. 1*b*, 2*b*, and 3*c*, and from 20 lb. to 25 lb. for cows 4*c*, 5, and 6. Unfortunately, however, four pages of the milk record, containing the results of periods VII., VIII., and IX., were accidentally destroyed before the results had been transferred from the milk-book.

Butter and Butter-fat.

The butter produced during this period was very firm, of good flavour, and kept very well, and might be classed as very good.

The average percentage of fat in the milk of each week was as follows:—

| | |
|--------------------|------|
| 1st week | 4.6 |
| 2d " | 5.2 |
| 3d " | 4.85 |
| 4th " | 5.0 |
| 5th " | 4.75 |

The weight of butter produced each week per 100 lb. of milk was as follows:—

| | |
|--------------------|------|
| | lb. |
| 1st week | 4.7 |
| 2d " | 5.73 |
| 3d " | 5.66 |
| 4th " | 5.42 |
| 5th " | 5.1 |

The following weights of milk were required to produce 1 lb. of butter:—

| | |
|--------------------|-------|
| | lb. |
| 1st week | 21.27 |
| 2d " | 17.45 |
| 3d " | 17.67 |
| 4th " | 18.45 |
| 5th " | 19.6 |

The butter produced during this period was fully greater than that from any other food, while it seemed to have none of the objectionable qualities of some of the others.

The percentage of pure fat in the butter of each week was as under:—

| | |
|--------------------|------|
| 1st week | 88.5 |
| 2d " | 85.0 |
| 3d " | 84.0 |
| 4th " | 84.0 |
| 5th " | 85.0 |

Of the total fat in the milk, the following percentages were recovered in the butter of each week:—

| | |
|--------------------|-------|
| 1st week | 90.4 |
| 2d " | 93.65 |
| 3d " | 95.95 |
| 4th " | 91.04 |
| 5th " | 91.26 |

The melting-point of the butter of each week was as under:—

| | |
|--------------------|-------|
| | Fahr. |
| 1st week | 98° |
| 2d " | 98° |
| 3d " | 105° |
| 4th " | 106° |
| 5th " | 103° |

The percentage of fat left in the butter-milk was as follows :—

| | | | | | | |
|------------|---|---|---|---|---|------------------|
| 1st week . | . | . | . | . | . | ·8 |
| 2d " . | . | . | . | . | . | ·8 |
| 3d " . | . | . | . | . | . | ·05 |
| 4th " . | . | . | . | . | . | ·17 |
| 5th " . | . | . | . | . | . | ... ¹ |

Owing to a breakage in the separator the one-half of the milk of the fourth week was churned as cream, while on the last three days the whole-milk was churned. The fat in the butter-milk from the cream was ·2 per cent, while in that from the whole-milk it was ·15 per cent. It is also worthy of notice, as showing the gradual decrease in the butter per 100 lb. of milk, that the first four days of the week yielded 5·61 lb. of butter per 100 lb. of milk, while the last three days yielded only 5·18 lb. per 100 lb. of milk. Both butters melted at 106° Fahr. The temperature at which the whole-milk had to be churned was the highest I have ever heard of—viz., 75° Fahr.—while the cream churned readily at 58° Fahr. The whole-milk was ripened under exactly the same conditions as the cream, but the first day the butter failed to come at a temperature of 66° Fahr. After three hours' churning it was set aside for the day, in the belief that it was not properly ripened. On the following morning churning was begun at 63° Fahr. and the temperature gradually raised 1° Fahr. every quarter of an hour, yet the butter did not come till it had been churned some time at 75° Fahr. The butter was firm, looked as if it had been worked too much, and did not keep so well as the other butters.

Solids other than Fats.

During the whole of this period these were high, the percentage each week being as follows :—

| | | | | | | |
|------------|---|---|---|---|---|------|
| 1st week . | . | . | . | . | . | 9·37 |
| 2d " . | . | . | . | . | . | 9·43 |
| 3d " . | . | . | . | . | . | 9·48 |
| 4th " . | . | . | . | . | . | 9·52 |
| 5th " . | . | . | . | . | . | 9·32 |

The percentage of solids other than fats in the skim-milk of a portion of this period was the highest I have ever come across, thus :—

| | | | | | | |
|------------|---|---|---|---|---|-------|
| 1st week . | . | . | . | . | . | 9·40 |
| 2d " . | . | . | . | . | . | 10·18 |
| 3d " . | . | . | . | . | . | 9·92 |
| 4th " . | . | . | . | . | . | 10·05 |
| 5th " . | . | . | . | . | . | 9·40 |

¹ Figures lost.

TABLE I.—SHOWING MEAN RESULTS OBTAINED DURING THE LAST TWO WEEKS WITH EACH FOOD.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Remarks re quality of butter, &c. |
|-------------------------|--------------|---------------------------------------|--------------------------|-------------------------------------|-----------------------------------|------------------------------|--------------------------------|---------------------------------|--------------------------|---|----------------------------|--|
| Food used. | No. of cows. | Average per cent of solids, not fats. | Average per cent of fat. | Per cent of fat in the butter-milk. | Per cent of fat in the skim-milk. | Melting-point of the butter. | Per cent of fat in the butter. | lb. butter per 100 lb. of milk. | Milk to 1 lb. of butter. | Per cent of fat in milk re-covered in butter. | Difference in live-weight. | |
| Pasture | 4 | 9.0 | 3.52 | 1.25 | .25 | Fahr. 90.1° | ... | 3.77 | 26.5 | 90.2 | lb. ... | Butter good. |
| Vetches | 4 | 9.03 | 3.92 | .5 | .25 | 91° | .. | 4.367 | 22.85 | 90.91 | ... | Milk decreased 48.7 per cent in a month. Butter firm and fair quality. |
| Vetches and grains | 4 | 9.35 | 3.6 | .71 | .25 | 92° | .. | 3.656 | 27.35 | 87.71 | ... | Milk increased 19 per cent. Butter soft, open, and of third quality. |
| Maize and barley. | 4 | 9.12 | 3.7 | 1.35 | .25 | 92.2° | ... | 3.996 | 25.0 | 91.71 | 26— | Milk average. Butter firm and of good quality. |
| Beans | 5 | 9.03 | 4.02 | .37 | .25 | 90.25° | ... | 4.308 | 23.2 | 91.09 ¹ | 15+ | Milk slightly decreased. Butter firm and good quality. |
| Paisley meal . . | 5 | 9.18 | 4.15 | 1.8 | .25 | 87° | 81.75 | 4.481 | 22.24 | 88.85 | 10+ | Butter normal. Butter porous and soft, third quality. |
| Oats | 5 | 8.88 | 4.26 | .27 | .25 | 90.75° | 88.8 | 4.721 | 21.0 | 93.7 | 25+ | Milk normal. Butter firm, good flavour, first quality. |
| Linseed-cake . . | 6 | 9.25 | 4.05 | .92 | .25 | 96° | 82.62 | 4.585 | 21.8 | 93.2 | 8— | Milk normal. Butter soft, rancid, and bad. |
| Decoricated cotton-cake | 6 | 9.42 | 4.87 | .08 | .20 | 104.5° | 84.5 | 5.26 | 19.02 | 91.15 | 47.8+ | Milk increased. Butter firm, good flavour, first quality. |

¹ Assuming the butter to contain 85 per cent of pure fat.

Summary.

The foregoing investigations seem to indicate—

1st. That at least two foods—viz., young fresh grass and grains—have the power of lowering the percentage of fat in the milk, and that other two—viz., vetches and decorticated cotton-seed-cake—have a tendency to increase it. This effect of grains and young grass upon the quality of the milk is well known to all dairymen. In both of these foods it seems to be combined with a tendency to increase the yield of milk, and the probability is, that the increased flow is the direct cause of the low quality, so that if judiciously used this effect of both foods may be turned to good account.

2d. That most changes of food seem to be followed by an increase of fat in the milk, but that there is a strong tendency for the milk to return to what may be called its normal condition. The maximum or minimum of fat seems to be reached in about ten days, and within other thirty the probability is that the milk will have returned to near its normal condition. This is clearly shown in the following table, where the means of each week for each period are given:—

TABLE II.—SHOWING HOW AFTER EACH CHANGE OF FOOD THE PERCENTAGE OF BUTTER-FAT IN THE MILK GENERALLY RISES, AND THEN GRADUALLY DECLINES TO NEAR THE NORMAL.

| Food. | Per cent of fat. | | | | |
|---|------------------|----------|----------|-----------|-----------|
| | 1st week. | 2d week. | 3d week. | 4th week. | 5th week. |
| Vetches | 4.2 | 3.86 | 3.89 | 3.96 | ... |
| Maize and barley . . . | 3.6 | 3.65 | 3.66 | 3.74 | ... |
| Beans | 4.4 | 4.33 | 4.09 | 3.95 | ... |
| Paisley meal | 4.11 | 4.43 | 4.38 | 4.26 | 4.05 |
| Oats | 4.24 | 4.49 | 4.46 | 4.5 | 4.26 |
| Linseed-cake | ... | 4.85 | 4.23 | 4.08 | 4.02 |
| Decorticated cotton-seed-cake | 4.6 | 5.2 | 4.85 | 5.0 | 4.75 |
| Average | 4.19 | 4.4 | 4.22 | 4.21 | 4.27 |
| Average of the last four foods | 4.24 | 4.74 | 4.48 | 4.46 | 4.27 |

Besides young pasture, a ration of green vetches¹ and dried grains is the only one used which has shown a distinct tendency to produce milk having a low percentage of butter-fat. Excluding this period, and taking the foods which have been used four weeks or longer, and calculating the fat in the milk

¹ Vetches alone increased the percentage of fat in the milk.

of the first week of each period as representing 100, we get the following figures for the others:—

| | |
|--------------------|-------|
| 1st week | 100·0 |
| 2d " | 105·0 |
| 3d " | 100·7 |
| 4th " | 100·5 |

The rise and fall is, however, more clearly shown if the last four foods of the table are used, as the number of animals employed was greater, and the time each food was used was five instead of four weeks, thus:—

| | |
|--------------------|-------|
| 1st week | 100·0 |
| 2d " | 111·1 |
| 3d " | 105·6 |
| 4th " | 105·2 |
| 5th " | 100·7 |

The probability seems to be that had the milk of the last two days of each period been tested separately, it might have shown a composition almost identical with what it was at the beginning, due allowance being made for the advanced period of lactation. Thus if we disregard the mere temporary fluctuations due to change of diet, the specific effect of the various foods upon the percentage of fat contained in the milk would seem to be comparatively small.

TABLE III.—SHOWING THE SOLIDS, OTHER THAN FATS, IN THE MILK OF EACH WEEK, AND THE AVERAGES OF THOSE USED FOUR AND FIVE WEEKS (UNLESS GRAINS AND VETCHES).

| Food. | 1st week. | 2d week. | 3d week. | 4th week. | 5th week. |
|---|-----------|-----------|-----------|-----------|-----------|
| | per cent. | per cent. | per cent. | per cent. | per cent. |
| Vetches | ... | 9·11 | 8·65 | 9·42 | ... |
| Maize and barley . . . | 8·98 | 9·32 | 9·00 | 9·25 | ... |
| Beans | 9·73 | 9·63 | 9·14 | 8·92 | ... |
| Paisley meal | 9·01 | 8·85 | 9·25 | 9·30 | 9·06 |
| Oats | 9·04 | 9·22 | 8·91 | 8·88 | ... |
| Linseed-cake | ... | 9·61 | 9·36 | 8·98 | 9·52 |
| Decorticated cotton-seed-cake | 9·37 | 9·43 | 9·48 | 9·52 | 9·33 |
| Average for four weeks . | 9·23 | 9·31 | 9·11 | 9·18 | .. |
| Average for five weeks . | 9·04 | 9·28 | 9·25 | 9·17 | 9·33 |

3d. That the solids other than fats in the milk seem to rise or fall in much the same manner as the fats, although to a less degree. The means for the foods which have been used for five weeks are as follows:—

| | | | | | | |
|-----------|---|---|---|---|---|------|
| 1st week. | . | . | . | . | . | 9.04 |
| 2d " | . | . | . | . | . | 9.28 |
| 3d " | . | . | . | . | . | 9.25 |
| 4th " | . | . | . | . | . | 9.17 |
| 5th " | . | . | . | . | . | 9.30 |

The average for the fifth week seems to be affected through omitting to test the milk produced from oats during that week. (See Table III., p. 312).

4th. That an increase of oil in the food does not seem to give any increase of fat in the milk. This is clearly shown during the period that linseed-cake was used. This food contained twice as much oil as the previous food (oats), yet on only one occasion (second week) did the milk contain a higher percentage of fat, thus:—

| Food. | Per cent of fat in the milk. | | | | |
|----------------|------------------------------|----------|----------|-----------|-----------|
| | 1st week. | 2d week. | 3d week. | 4th week. | 5th week. |
| Oats . . . | 4.24 | 4.49 | 4.46 | 4.5 | 4.26 |
| Linseed-cake . | ... | 4.85 | 4.23 | 4.08 | 4.02 |

5th. That the effect of food is more marked in the quality of the butter produced than in the quantity. Like the fat in the milk, the yield of butter seems to attain its maximum about the middle of the second week, after which it decreases, attaining the normal again about the end of the fifth week.

TABLE IV.—SHOWING THE TENDENCY OF THE BUTTER TO RISE AFTER EACH CHANGE OF FOOD, AND THEN TO RETURN TO NEAR THE NORMAL.

| Food. | Butter in lb. per 100 lb. milk. | | | | |
|----------------------------------|---------------------------------|----------|----------|-----------|-----------|
| | 1st week. | 2d week. | 3d week. | 4th week. | 5th week. |
| Vetches | 4.000 | 3.9 | 4.5 | 4.234 | ... |
| Maize and barley | 3.532 | 3.672 | 4.086 | 3.906 | ... |
| Beans | 4.734 | 4.164 | 4.320 | 4.297 | ... |
| Paisley meal | 4.057 | 4.375 | 4.519 | 4.500 | 4.445 |
| Oats | 4.717 | 4.916 | 4.638 | 4.280 | 4.650 |
| Linseed-cake | 5.100 | 5.720 | 5.020 | 4.670 | 4.500 |
| Decorticated cotton-seed-cake . | 4.700 | 5.730 | 5.660 | 5.420 | 5.100 |
| Average | 4.406 | 4.639 | 4.677 | 4.472 | 4.674 |
| Average of the last four foods . | 4.643 | 5.185 | 4.959 | 4.72 | 4.674 |

Calculating as before the quantity produced during the first week as 100, we get the following averages for the foods used four weeks or longer:—

| | | | | | | |
|------------|---|---|---|---|---|-------|
| 1st week . | . | . | . | . | . | 100.0 |
| 2d " . | . | . | . | . | . | 105.3 |
| 3d " . | . | . | . | . | . | 106.1 |
| 4th " . | . | . | . | . | . | 101.5 |

Taking the foods which were used five weeks, we get the following results:—

| | | | | | | |
|------------|---|---|---|---|---|-------|
| 1st week . | . | . | . | . | . | 100.0 |
| 2d " . | . | . | . | . | . | 111.7 |
| 3d " . | . | . | . | . | . | 106.8 |
| 4th " . | . | . | . | . | . | 101.6 |
| 5th " . | . | . | . | . | . | 100.7 |

The melting-points of the butters produced by the consumption of the various foods varied considerably, ranging from 87° Fahr. to 104½° Fahr. (see column 7, Table I., p. 310).

6th. That some foods seem to produce milk from which a much greater percentage of the fat can be recovered by churning than others. This is very clearly indicated in column 5 of Table I., which shows the percentage of fat in the butter-milk, and also in column 11 of the same table, where the percentage of fat in the milk, which has been recovered as butter, is stated.

7th. That the greatest difference in the effect of the foods was seen in the quality of the butter. In fact, most foods seem to have some effect on the flavour, melting-point, or keeping qualities of the butter produced by their use. The butter from the use of linseed-cake had a rancid smell by the third or fourth day, while that from the consumption of oats, beans, or decorated cotton-seed-cake did not reach the same stage when kept in a warm part of the house till about ten days later.

8th. That some foods produce butter which retains much more water than others, and butters which have a large percentage of water in them seem usually to be of second or third class quality. Only a few of the butters were tested for pure fat, and it is to be regretted that all were not, for it is evident that the percentage of water a butter contains not only determines its quality, but is also a necessary factor in accurately estimating the "churnability" of the fat in the milk. Like the fat in the milk, the fat in the butter seems to have a strong tendency to revert to near normal conditions, as is shown in the following table:—

| Food. | Per cent of fat in butter. | | | | |
|------------------------------|----------------------------|----------|----------|-----------|-----------|
| | 1st week. | 2d week. | 3d week. | 4th week. | 5th week. |
| Paisley meal | ... | ... | .. | 81·25 | 82 5 |
| Oats | 89·0 | 89·0 | 85·0 | 84·7 | 83·0 |
| Linseed-cake | 80·2 | 77·5 | 78·0 | 81·25 | 83 0 |
| Decorticated cotton-cake . . | 88·5 | 88·0 | 84·0 | 84 0 | 85·0 |

In the revival of this report I have had the assistance of Mr David Wilson, yr. of Carbeth, who has not only made numerous corrections, but has suggested several valuable additions. I have arranged to continue this investigation during the present year (1896), and hope, with Mr Wilson's assistance and co-operation, and the experience gained during the past nine months' work, to plan the experiments so that they may yield results that will justify me in drawing more definite conclusions, as to the various effects of food on the quantity and quality of milk, than have hitherto been possible.

THE CEREAL AND OTHER CROPS OF SCOTLAND FOR 1895, AND METEOROLOGY OF THE YEAR RELATIVE THERETO.

THE CROPS.

THE following comparison of the cereal and other crops of 1895 with those of the previous year, has been prepared by the Secretary of the Society from answers to queries sent to leading agriculturists in different parts of the country.

The meteorology of the year has been furnished by Dr Alex. Buchan, Secretary of the Meteorological Society of Scotland.

The queries issued by the Secretary were in the following terms:—

1. What was the quantity, per imperial acre, and quality of grain and straw, as compared with last year, of the following crops? The quantity of each crop to be stated in bushels. What quantity of seed is generally sown per acre?—(1) Wheat, (2) Barley, (3) Oats.
2. Did the harvest begin at the usual time, or did it begin before or after the usual time? and if so, how long?

3. What was the quantity, per imperial acre, and quality of the hay crop, as compared with last year, both as regards ryegrass and clover respectively? The quantity to be stated in tons and cwts.
4. Was the meadow-hay crop more or less productive than last year?
5. What was the yield of the potato crop, per imperial acre, as compared with last year? The quantity to be stated in tons and cwts. Was there any disease? and if so, to what extent, and when did it commence? Were any new varieties planted, and with what result?
6. What was the weight of the turnip crop, per imperial acre, and the quality, as compared with last year? The weight of the turnip crop to be stated in tons and cwts. How did the crop braird? Was more than one sowing required? and why?
7. Were the crops injured by insects? State the kinds of insects. Was the damage greater or less than usual?
8. Were the crops injured by weeds? State the kinds of weeds. Was the damage greater or less than usual?
9. Were the pastures during the season of average growth and quality with last year?
10. How did stock thrive on them?
11. Have cattle and sheep been free from disease?
12. What was the quality of the clip of wool, and was it over or under the average?

From the answers received, the following notes and statistics have been compiled:—

EDINBURGHSIRE. *Wheat*.—About 40 bushels; quality about the same as last year; straw about the same; 3 bushels seed sown.

Barley.—About 44 bushels; quality about the same as last year; most demand for Chevalier; 3 bushels seed sown.

Oats.—About 48 bushels; quality not so fine as last year; straw about the same; 4 bushels seed sown.

Harvest commenced 26th August, about the same as last year; first week very wet, weather fine after, and during all September.

Hay.—Very light crop, and fairly well got; 2 tons. Fine second crop, and well secured; better quality in most cases than the first. *Meadow-hay*.—About the same as last year, and very well got.

Potatoes.—Fully as heavy a crop as last year. Regents very much diseased. Maincrops and Bruce quite free from disease.

Turnips.—Fully as heavy a crop as last year. Yellows, 25 to 30 tons; swedes, 20 to 25. Only once sown.

No damage by insects. Most damage done to the grain crop by sparrows, which are every year getting more numerous. No injury by weeds.

Live Stock.—Pastures not so good as last year. Stock did not feed so well as last year. Cattle and sheep quite free from disease. *Clip of wool*.—About the same as last year; price rather better.

LINLITHGOWSHIRE. *Wheat*.—Not so good either in quantity or quality as last year; from 20 to 30 bushels; seed from $2\frac{1}{2}$ to 3 bushels.

Barley.—Not so good in quantity and quality as last year; from 20 to 35 bushels; seed from $2\frac{1}{2}$ to 3 bushels.

Oats.—About the same quantity of grain, but less straw than last year; seed from 4 to 6 bushels.

Harvest began and ended from two to three weeks earlier than last year.

Hay.—Less in quantity, but about the same in quality as last year; from 1 to 2 tons. *Meadow-hay*.—Not so good as last year, but very little grown in the district.

Potatoes.—Less in quantity and about the same in quality as last year; very little disease; from 3 to 6 tons.

Turnips.—Very variable; some places good, others almost a failure; did not braird well; a good deal of second sowing.

No injury by weeds or insects.

Live Stock.—Pastures much under the average. Stock did not thrive well. Cattle and sheep free from disease. *Clip of wool*.—About the average.

HADDINGTONSHIRE (Upper District). *Wheat*.—None grown.

Barley.—32 bushels; quality of both grain and straw better than last year; 3 bushels sown.

Oats.—40 bushels; quality of both grain and straw better than last year; 4 bushels sown.

Harvest began on 29th August, about the same time as in 1894; shortest harvest on record.

Hay.—2 tons, and of better quality than last year. *Meadow-hay*.—Less productive than last year.

Potatoes.—6 tons; no disease; no new varieties planted.

Turnips.—19 tons; better quality than last year. Crop brairded well; only one sowing.

Crops not injured by insects. No injury by weeds.

Live Stock.—Pastures better in growth and quality than last year. Stock throve very well. Cattle and sheep free from disease. *Clip of wool*.—An average clip.

HADDINGTONSHIRE (Lower District). *Wheat*.— $5\frac{1}{2}$ quarters; fair quality; not so much straw; $3\frac{1}{2}$ bushels sown.

Barley.—40 to 44 bushels; quality middling; not so good as last year; quite as much straw; $2\frac{1}{2}$ bushels sown.

Oats.—40 bushels; fair quality; short straw, not nearly so much as last year; 4 bushels sown.

Harvest began 19th August, or about the same time as last year; very bad weather for first ten days.

Hay.—Rather less than last year; 2 tons.

Potatoes.—7 tons; no disease.

Turnips.—15 to 18 tons, or rather less than last year. A great deal of second sowing, as first sowing did not braird owing to dry weather.

No damage by insects. No damage by weeds.

Live Stock.—Pastures bare owing to continued drought, but of good quality. Stock throve well. A good deal of foot-rot in sheep in the autumn. *Clip of wool*.—An average.

BERWICKSHIRE. *Wheat*.—30 bushels; quality rather under average; straw under average; seed sown, 3 bushels.

Barley.—37 bushels; quality much under average; straw, do.; seed sown, 3 bushels.

Oats.—36 bushels; quality above average; straw one-third less than average; seed sown, $4\frac{1}{2}$ bushels.

Harvest began about the usual time, 24th August.

Hay.—About half a crop; 100 stones—22 lb. to the stone; quality above average, when it was early cut, say 21 cwt.; later crop was damaged by wet weather. *Meadow-hay*.—Very much less than last year.

Potatoes.—Much larger than last year; $8\frac{1}{2}$ tons; no disease to speak of; a few varieties were planted with success.

Turnips.—Greatly under average; 10 to 12 tons; most of the crop brairded badly; killed off with frost and fly; required to be sown two or three times.

Frost and insects greater damage than usual. No injury by weeds.

Live Stock.—Pastures were not of average growth and quality with last year. Stock thrived fairly well after June, and were free from disease.

Clip of wool.—Under average.

ROXBURGHSHIRE. *Wheat*.—Very small breadth sown in this district; of an average crop; about 30 bushels, but under an average bulk of straw; quality fair.

Barley.—About 31 bushels, but under average bulk of straw; quality dark in colour, but average weight.

Oats.—Under average crop; good quality, about 30 bushels; very small bulk of straw.

Harvest about ten days earlier.

Hay.—Rather under an average crop; about $1\frac{1}{2}$ tons; the quality scarcely so good, not being so well grown as last year. *Meadow-hay*.—Generally a better crop than last year.

Potatoes.—Above an average crop; about 6 tons marketable. Some sorts a good deal diseased, which came on about the beginning of September, but the Maincrop kidney were entirely free of disease.

Turnips.—Improved greatly of late into a good crop, especially swedes; about 20 tons. No second sowing.

Little or no damage by insects. A good deal of wild mustard in some districts.

Live Stock.—Pastures suffered a good deal in June with the dry weather, but a great growth in the after months. Stock did well, and were free from disease. *Clip of wool*.—About an average, quality good.

SELKIRKSHIRE. *Wheat*.—None grown.

Barley.—32 bushels; quality better; seed sown, nearly 4 bushels.

Oats.—36 bushels; quality much better; straw little more than a half; quality much better; seed sown, $4\frac{1}{2}$ bushels.

Harvest began about the usual time; weather unusually fine.

Hay.—Little over half a crop; quality first-class; 1 ton 6 cwt. *Meadow-hay*.—Half a crop.

Potatoes.—Both quantity and quality better; 8 tons; no disease; no new varieties that I know of. Very fine potatoes grown for sale in this county.

Turnips.—Lighter crop than last year; quality good; 14 tons. Crop brairded partially owing to the dryness of the land. On several farms re-sowing was required.

Almost no injury by insects. No injury by weeds.

Live Stock.—Pastures under average; quality good owing to drought. Stock thrived well and were free from disease. *Clip of wool*.—A good average.

PEEBLESHIRE. *Oats*.—32 bushels; quality of grain and straw very good, and better than last year; 5 bushels seed sown.

Harvest began at the usual time.

Hay.—Ryegrass 1 ton; clover and ryegrass well mixed; quality good.
Meadow-hay.—Less productive.

Potatoes.—9 tons; yield better than last year; little disease; no new varieties planted.

Turnips.—18 tons; quality good; better than last year. One sowing only required.

No injury by insects or weeds.

Live Stock.—Pastures during the season not of average growth and quality with last year. Stock thrived fairly well, and were free from disease. *Clip of wool*.—Average quality and quantity.

DUMFRIESSHIRE (Annandale). *Wheat*.—None grown in district.

Barley.—Grain 1894, 30 bushels—1895, 35 bushels; straw 1894, 18 cwt—1895, 15 cwt.; seed sown—drilled, $2\frac{1}{2}$; broadcast, $3\frac{1}{2}$ bushels.

Oats.—Grain 1894, 30 bushels—1895, 38 bushels; straw 1894, 25 cwt.—1895, 17 cwt.; seed sown—drilled, $3\frac{1}{2}$; broadcast, 5 bushels.

Harvest began 1895, September 2; 1894, September 3.

Hay.—The average in 1894 would be about 30 cwt. This season, owing to drought, the average would hardly reach 18 cwt.—a good many put it at 15 cwt. Clover was abundant in 1894. This season, owing to the prolonged drought, there was scarcely any to be seen in the hay; although it was very plentiful in the aftermath. *Meadow-hay*.—Would be at least one-third short from 1894.

Potatoes.—Average crop; in 1894, 8 tons—1895, 10 tons. No new varieties planted.

Turnips.—Crop variable. In some places the seed lay in the ground nine weeks before brairding. Some farmers re-sowed, others waited until the rain came. Average, 1894, 20 to 25; 1895, 12 to 15. The quality of the crop in 1895 would be much below that of 1894, owing to the short period the roots had for maturing, and the forcing nature of the weather in September. In some districts where they had local thunder-showers to braid the plants in season, the crop grown is the largest for many years—35 tons being spoken of.

Damage greater than usual.

Owing to the dry summer, weeds were easily kept under; and no damage was done by weeds where ordinary care was taken.

Live Stock.—Pastures were very backward during the summer, but there was more than an average growth during August and September. Stock thrived well,—better than could have been expected, considering the burnt-up nature of their pasture, and during summer were free from disease; but in late autumn and early winter there was a heavy death-rate amongst sheep on turnips, particularly rams and old sheep, attributed to turnip crop being green and not properly matured. *Clip of Wool*.—Rather under the average.

DUMFRIESSHIRE (Upper Nithsdale). *Wheat*.—Not grown.

Barley.—Not grown.

Oats.—28 bushels, of good quality; straw very short, but well secured; 5 bushels of seed generally sown.

Harvest began earlier than usual, but still ten days later than previous year.

Hay.—The crop almost a failure owing to drought; much of it fairly burnt up, and consequently of poor quality; weight from 10 to 20 cwt. Little clover in the hay, but good aftermath consequent on abundant rainfall. *Meadow-hay*.—About half a crop, unless where heavily manured and early hained.

Potatoes.—Double previous year, say 8 tons; early varieties suffered considerably from disease; late varieties quite sound.

Turnips.—The worst crop on record, and so varied that an estimate is impossible; unless where circumstances exceptional seed never brairded. Sown twice or three times, and only succeeded after the rainfall in July, but then too late for a crop.

Insects did little damage to crops, with exception of turnip braird, which was eaten as it appeared, in the few cases in which it germinated at all. The drought, which continued till July, effectually disposed of all kinds of weeds, and no damage sustained from that cause.

Live Stock.—All pastures were unusually bare till into August, and only showed normal growth in autumn. Where not overstocked cattle and sheep thrived well. In many cases stock suffered severely from want of sufficient grass, and had to be assisted with artificial food. Cattle free from disease. Sheep in autumn suffered as usual from lameness. Scab appeared on many farms, having been introduced into the county from the north of Scotland and Yorkshire. *Wool*.—The long-continued storm in spring caused a light clip of only moderate quality.

DUMFRIESSHIRE (Eskdale). *Wheat*.—No wheat grown in this district.

Barley.—Almost none grown—certainly not 10 acres in the whole district owing to drought in early summer; yield would not exceed 35 bushels; 3 bushels seed sown.

Oats.—Both grain and straw in excess of last year, probably to the extent of 4 bushels grain and 5 cwt. straw; quality of both good, quite equal to last year; seed sown, 5 bushels.

Harvest about a fortnight earlier than usual, but ten days later than last year.

Hay.—Ryegrass light crop, and as a rule badly got; about 2 tons and 10 cwt. lighter than last year. *Meadow-hay*.—Very light, about 20 cwt.; quite 15 cwt. lighter than last year, but very well got.

Potatoes.—Heavy crops; about 6 tons; nearly free from disease; probably 20 cwt. heavier than last year. No very new varieties planted; Champions not so productive as usual, and not so disease-resisting.

Turnips.—Not nearly so heavy as last year, perhaps to the extent of 5 tons; about 15 tons this year; swedes, 18 tons; quality quite as good as last year. Crop when sown early brairded remarkably well, but when late came slowly away owing to a few weeks cold rainy weather. Scarcely any second sowing required.

Scarcely any injury by insects. Wild mustard and red-shank very prevalent, but no damage accrued where properly wrought.

Live Stock.—The pastures were unusually forward in April and May, but suffered afterwards from cold wet weather, but came away most luxuriantly when dry warm weather set in; on the whole better than last year, when the drought was excessive. Stock thrived very well indeed, especially on hill lands; were lean at clipping, but thrived amazingly afterwards. Cattle very free from disease. Sheep equally so, except upon farms where braxy is prevalent, upon many of which heavy loss has been sustained as usual. A more than usual loss has occurred amongst hogs fed on turnips, where hay or dry food was not liberally supplied, probably owing to unripe turnips. *Clip of wool*.—About an average both in quantity and quality.

KIRKCUDBRIGHTSHIRE. *Wheat*.—28 bushels; quality average; straw deficient; seed, $2\frac{1}{2}$ to 3 bushels.

Barley.—32 bushels; quality fair; straw very short; seed, $3\frac{1}{2}$ to 4 bushels.

Oats.—28 bushels; fair weight, but inferior in colour; straw about 40 per cent deficient; seed, $4\frac{1}{2}$ to 5 bushels.

Harvest about a week earlier than average time.

Hay.—20 to 25 cwt.; quality good; quantity very deficient. *Meadow-hay*.—Crop same as above.

Potatoes.—7 to 8 tons; not much disease; some early varieties much injured by frost, but crop as a whole much over an average. No new varieties in this district.

Turnips.—12 to 14 tons; very far below an average; brairded very irregularly owing to dry weather in May and June; a large breadth resown owing to cause stated.

No injury by insects. Crops injured by annual weeds when land was damp, and the crop did not braird as usual.

Live Stock.—Owing to drought the pasture was deficient in summer, but very good after rain came in August and September. Stock thrive well, and were free from disease. *Clip of wool*.—Fully average in quality and weight.

WIGTOWNSHIRE. *Wheat*.—24 bushels; quality moderate; straw not good; seed, 3 bushels.

Barley.—30 bushels; quality inferior; straw short; 4 bushels sown.

Oats.—32 bushels; grain dark in colour; straw short and poor.

Harvest ten days earlier.

Hay.—1 ton 10 cwt.; quality fair, but quantity much inferior to last year. *Meadow-hay*.—Very light; much less productive.

Potatoes.—Extra good crop; 8 tons; no disease of any extent; no new varieties planted.

Turnips.—14 tons; variable; much inferior generally to last year. Crop did not braird well. More than one sowing required, supposed on account of drought.

No injury by insects or weeds.

Live Stock.—Pastures not of average growth owing to drought, but quality good. Stock thrive on them, and were free from disease. *Clip of wool*.—Average both in quantity and quality.

AYRSHIRE. *Wheat*.—Very little grown; straw less.

Barley.—Little grown, but about 4 bushels sown; straw less.

Oats.—Under average, about one-third less; 5 bushels; straw less.

Harvest an average time.

Hay.—About 1 ton to acre. *Meadow-hay*.—Crop a half of last year.

Potatoes.—A good crop, above average; 6 tons per acre; little disease.

Turnips.—Crop under average; did not braird well owing to dry season, and a good many had to sow over again; 12 tons an average.

Not many insects, except in turnip crop. Damage not any greater. Not many weeds owing to dry season.

Live Stock.—Pastures under average; too dry in spring to let growth come away. Stock thrive pretty well. No disease worth mentioning.

Clip of wool.—About average.

BUTE. *Wheat*.—None grown.

Barley.—About 32 bushels; good average crop; seed sown, 4 bushels.

Oats.—About 38 bushels; good average crop; seed sown, 5 to 6 bushels.

Harvest commenced on 25th August, a few days earlier than usual.

Hay.—Crop a good average, about 2½ tons; quality good. *Meadow-hay*.—Little in this island; but what crop there was, was above the average.

Potatoes.—Early potatoes commenced to be dug on 12th June; crop generally an excellent one. Late potatoes also a very heavy crop; yield from 6 to 10 tons; little disease; no new varieties of consequence.

Turnips.—Crop above an average; 25 to 35 tons; crop brairded well; no resowing.

No injury of consequence by insects. Little injury by weeds.

Live Stock.—Pastures during the season of average growth and quality with last year. Stock thrived on them, and were free from disease. *Clip of wool*.—A good average.

ARRAN. *Wheat*.—None grown.

Barley.—Good crop, but very little grown; about 40 bushels; seed sown, $3\frac{1}{2}$ bushels.

Oats.—32 bushels; quality fair; rather short of straw on dry soils; weight per bushel under last year; seed sown, 5 to 6 bushels.

Harvest about one week later than last year, but a good harvest.

Hay.—Very much under last year; quantity about 1 ton; seed very heavy; some samples over 30 lb. per bushel. *Meadow-hay*.—Little grown, and less productive than usual.

Potatoes.—Yield more, about 10 tons as dug; very little disease, unless the early varieties on damp soils.

Turnips.—8 to 30 tons, very variable; much better when early sown; braided badly owing to dry weather; a good deal of finger-and-toe.

A good deal of turnip-fly on stiff soils. Very little grub. Less weeds than usual.

Live Stock.—Pastures not so good as last year owing to dry month of June; improved later on; quality under average. Stock thrived fairly well, and were free from disease. *Clip of wool*.—Under average; quality fair.

LANARKSHIRE (Upper Ward). *Wheat*.—None grown.

Barley.—None grown.

Oats.—Quality good, about 36 to 40 bushels; straw quite a third less than last year; quantity sown from 5 to 6 bushels.

Harvest about a week earlier than last year.

Hay.—Quantity much less than the average; about 20 cwt., and in many cases in the higher districts less. *Meadow-hay*.—Generally in this district from a third to a half less than last year.

Potatoes.—From 6 to 7 tons; quality excellent; almost no disease; no extent of any new varieties planted.

Turnips.—From 20 to 25 tons; generally the braird was fairly well got; in some cases resowing occurred through drought.

Almost no insects. Finger-and-toe showed itself in some fields, but not to any great extent. No injury by weeds.

Live Stock.—Pastures in early part of the season badly burned up, latter part especially; in September exceptionally good. Stock thrived fairly well, especially towards the end of the season. Cattle and sheep free from disease, sickness, or braxy; have been over the average amongst sheep. *Clip of wool*.—About an average.

LANARKSHIRE (Middle Ward). *Wheat*.—40 bushels, fair quality; straw, 2 tons; seed from 3 to 4 bushels. Owing to very severe winter some wheat came up very thin; in many cases barley had to be sown in spring.

Barley.—None grown.

Oats.—40 bushels; fair quality; straw similar to last year— $1\frac{1}{2}$ ton, some districts more; seed sown, 4 to 5 bushels.

Harvest fortnight later; good weather.

Hay.—Ryegrass 1 to $1\frac{1}{2}$ ton; middling quality; very short, owing to drought; light land fields burned up; great aftermath. Timothy, 2 tons; fair quality. *Meadow-hay*.—Average crop, but bad weather for searing it.

Potatoes.—2 to 3 tons less than previous year; yield from 5 to 8 tons.

Regents diseased badly ; favourite varieties planted—Sutton's Abundance and Maincrops.

Turnips.—Owing to drought this crop can hardly be estimated ; in many cases seed lay unbraided until August ; rapid growth after that, but poor crop in bulk. Where early braided, yield, Swedes, 20 tons ; Yellows, 16. Lot of resowing.

No injury by insects or weeds.

Live Stock.—Pastures deficient in early summer owing to drought, but abundant after August. Stock thrived well, and were free from disease.

Clip of wool.—Average.

LANARKSHIRE (Lower Ward). *Wheat*.—40 bushels, deficient in straw ; quality not so good ; seed sown, 4 bushels.

Oats.—48 bushels ; short of straw ; quality better than last year ; seed sown, 5 bushels.

Harvest started about the 1st of September. About ten days later than usual.

Hay.—The quality good ; 1 ton 10 cwt., but a lot wasted with bad weather. *Meadow-hay*.—Scarcely so heavy as last year.

Potatoes.—10 tons ; better than last year in the earlier kinds ; some disease ; some new kinds started in August with good results.

Turnips.—20 tons ; very irregular braided, and more than one sowing. No damage. Wild mustard in oats more than usual.

Live Stock.—Pastures in early summer burned with drought, but great growth in autumn. Stock thrived very well, and were free from disease.

RENFREWSHIRE (Middle Ward). *Wheat*.—48 bushels ; straw at least equal to last year ; seed sown, 4 bushels.

Barley.—Scarcely any barley grown.

Oats.—32 bushels ; straw about one-third less than last season ; seed sown, 6 bushels.

Harvest began about ten days earlier.

Hay.—Ryegrass about $1\frac{1}{2}$ ton, at least one-fourth under average ; Timothy about 2 tons ; at least one-fifth ; quality a fair average. *Meadow-hay* less productive.

Potatoes.—8 tons, in some cases 12 to 14, except among Regents and some of the old varieties ; there was little disease ; but Regents, &c., in some cases were at least one-half bad.

Turnips.—Where turnips braided shortly after first sowing, there was an excellent yield, from 20 to 30 or 35 tons ; where late of sowing, or sown a second time, crop was deficient—not more than from 10 to 15 tons.

No injury by insects or weeds.

Live Stock.—In a few places pasture was average, but on shallow soils particularly under average. Stock thrived much better than state of pasture indicated. Cattle and sheep free from disease *Clip of wool*.—Average.

RENFREWSHIRE (Upper Ward). *Wheat*.—Not much grown ; average crop about 30 bushels ; seed sown, 3 bushels.

Barley.—None.

Oats.—36 to 40 bushels ; quality good ; straw deficient. Good harvest, commenced about the beginning of September, and grain was got into stackyard in good condition.

Hay.—Very light crop. Ryegrass averaged 1 to $1\frac{1}{2}$ ton. The weather was favourable.

Meadow-hay.—Very light crop, and much damaged by wet weather.

Potatoes.—A good crop ; from 7 to 9 tons ; very free from disease. 'Garton's' were introduced, and proved very large croppers.

Turnips.—Seed that braided well and early were a large crop, from 20 to 25 tons. A good breadth had to be resown owing to dry weather, and were a very poor crop.

No injury by insects. No trouble with weeds.

Live Stock.—Pastures deficient from previous year. Stock scarcely thrived so well as last year. Cattle and Sheep free from disease. *Clip of wool*.—Average.

RENFREWSHIRE (Lower Ward). No wheat or barley grown.

The oat crop was light both as to grain and straw, and would, in regard to straw, be less than half the average quantity, the deficiency in grain being about one-third less than the average. The dry weather in the spring, and especially in May, a month of much importance for starting the growth of cereal and grass crops, was extremely dry, only 0.21 of rainfall being recorded, which accounted for the shortness in these and other crops. The crops in the richer soils, to a certain extent, partially recovered, and had favourable weather prevailed in the month of August prospects would have been better, but as it was the excessive moisture of that month, 8.58 being the amount of rainfall, damaged the crops, and during it and September crops were laid, and being unevenly ripened, together with a second growth, the harvest was retarded, and did not commence until ten days later than usual.

Hay.—Ryegrass suffered from the absence of a drippy month of May, and in many cases was only half a crop. The foggage, however, was a better crop than usual where there was a root of clover; and in some cases the crop was very good, and the weather was not altogether unfavourable for securing it. *Meadow-hay* was less in quantity than last year, but not below an average.

The potato crop was good, being about the same as last year, and the yield averaged 5 to 6 tons; quality good, and disease, which appeared about the end of August in the earlier varieties, such as Sutton's Abundance and Regents, and also in Champions, a later kind, to the extent of a third and a half; in the later sorts little or no disease appeared, and none in Maincrops; and it may be stated that Regents and Champions are not now much grown in the district.

The turnip crop was troublesome to start. That sown in the early part of May, first sowing succeeding, were an excellent crop; but the first sowings failing, two and sometimes three sowings were necessary. The drought and the fly caused light and uneven crops.

Insects were not observable beyond the turnip-fly.

Live Stock.—Pastures during the earlier part of the season, from the heat and drought, were extremely bare, and hand feeding was necessary in many cases; but after the rain set in the growth of grass came away, and the outside keep was more than usually abundant in the autumn months. Stock thrived fairly well, and there can be no doubt that in dry seasons the quality and feeding properties of pastures are greater than in excessively wet ones, showing distinctly the virtue in pastures in a dry climate from that in a too moist one. There has been no disease in the flocks and herds.

ARGYLLSHIRE (District of Oban). *Wheat*.—None.

Barley.—None.

Oats.—Seed sown 6 bushels; return 6 to 10 times; lea straw good quantity and quality; after green crop less in quantity; grain up to average; straw under.

Harvest began about the usual time, but finished late because of rain.

Hay.—50 per cent below average; not very nutritious from drought.

Meadow-hay.—Where late ground it improved very much ; quantity from 50 per cent to 75 per cent of average crop.

Potatoes.—Quantity good ; quality poor in many cases, owing to second growth ; a little disease in a few places.

Turnips.—From nothing to 16 tons. In many cases the dry season made second and even third sowings requisite, and they did not always come then. Early sowings very fair as to both bulk and quality, especially swedes.

Weeds less than usual from drought.

Live Stock.—Sown pastures bare, but good quality ; hill pastures better, but heather did not flower well. In spite of all stock thrived well. It must have been because of quality of pasture, as quantity was short. Cattle and sheep free from disease. Perhaps with late rains footrot a little prevalent. Many weak sheep were cleared off by last winter's severity. *Clip*—light and rather hard yoke, rose late.

ARGYLLSHIRE (District of Lochgilphead). *Wheat*.—None grown.

Barley.—None grown.

Oats.—Yield about 36 tons ; seed sown, 6 bushels ; quality of grain and straw good ; on the whole pretty much like last year's crop.

Harvest.—Six days earlier than last year.

Hay.—About 1 ton 15 cwt. ; quality and bulk much better than last year. *Meadow-hay*.—Less ; quality good, but very short.

Potatoes.—On red land an abundant crop, but those planted on moss land were very much damaged by the severe frost on the 13th of June ; slightly affected with disease, which commenced about the middle of September.

Turnips.—Weight—in some localities very good, about 30 tons ; but in others, where a second sowing was necessary, the crop is a poor one. The crop braided fairly well, but the long continuation of dry weather and frost at night at end of May and early part of June accounted for a second sowing.

Insects.—None noticed. No injury by weeds.

Live Stock.—Pastures were very good—quite an average with last season. Stock thrived exceedingly well, and were free from disease. *Clip*—Good average ; quality good.

ARGYLLSHIRE (District of Kintyre). *Wheat*.—None grown.

Barley.—A good, fair crop, would average from 32 to 40 bushels ; seed sown, from 3 to 4 bushels.

Oats.—Only an average crop, or perhaps rather under ; straw short ; grain good, and turned out well as to bulk ; average about 32 bushels ; seed sown, about 5 bushels.

Harvest began about a fortnight earlier than usual.

Hay.—Not much above the half of last year's crop ; quality fair ; and the most of it got in in good condition ; about 1 ton. *Meadow-hay*.—A fair average crop.

Potatoes.—Early potatoes a good crop and very little disease amongst them, from 6 to 8 tons ; late potatoes an excellent crop and little disease, from 8 to 10 tons.

Turnips.—Those that braided early turned out an excellent crop, but late sown was not an average crop. Some fields or parts of fields had to be sown a second time owing to very dry weather. Average crop in the district, about 25 tons.

Very little injury by insects, less than usual. No injury by weeds.

Live Stock.—Pastures very poor in the early part of the season, but improved greatly after the rain came. Stock thrived fairly well. No disease, except braxy in sheep. *Clip*—About an average.

ARGYLLSHIRE (islands of Islay, Jura, and Colonsay). *Wheat*.—None grown.

Barley.—Very little grown.

Oats.—Straw was lighter than last year, but the grain was rather heavier; about 6 bushels usually sown.

Harvest commenced about the usual time, and most of the crops were secured in good condition.

Hay.—Ryegrass and clover crops were considerably lighter than last year; fully one-third lighter all over. *Meadow-hay*.—Much less productive.

Potatoes.—The crop was exceptionally good, and was not much affected with disease. In some places disease showed itself early in September.

Turnips.—The crop was very variable, and in many places had to be sown twice owing to drought and fly. This was especially the case with what was late of being sown. Where early sown the crop was quite equal to last year, but where the blight was not strong before the drought commenced, the crop was at least one-third lighter than last year.

The damage by turnip-fly was greater than usual, and grub showed in several places, but not more than usual. Not more than usual injury by weeds.

Live Stock.—In June pastures were much burned up, but latterly they came away well. Stock thrived as well as usual on them. Cattle and sheep have not suffered more than usual from disease. Many farms had a much lower death-rate than for some years; on others braxy and trembling were prevalent. The quality of wool was rather over the average.

ARGYLLSHIRE (District of Inverary). *Wheat*.—None grown.

Barley.—Scarcely any grown.

Oats.—A fair crop, not heavy, and damaged by rain—probably 24 bushels; straw light and not good.

Harvest began much about the usual time.

Hay.—Crop light owing to dry spring and summer, but fairly well saved; average about 22 cwt. *Meadow-hay*.—On damp soils a heavy crop, but badly saved; on dry ground, unless late of being cut, under usual crop; all round damaged by rain.

Potatoes.—A good steady crop, probably 9 to 10 tons; scarcely any disease; generally varieties now common.

Turnips.—Crop heavy, in some cases even 30 tons; firm and free of disease. In some cases had to be resown.

Little loss by insects; fly may have done a little. Weather very dry at sowing time, and weeds kept down. Some wild mustard and flowering nettle.

Live Stock.—Pastures were during the season of average growth and quality with last year. Stock thrived on them, and were free from disease. *Clip of wool*.—Quite as good as last year.

DUMBARTONSHIRE. *Wheat*.—22 bushels; straw about 25 cwt.; neither as good as last year. Seed sown, 2½ to 3 bushels.

Barley.—Not a crop of any importance in this county.

Oats.—High land parishes about 25 to 30 bushels; best low land parishes, 40 to 50 bushels; straw about 30 cwt.; neither grain nor straw so good as 1894; seed sown, low land, 3½ bushels; high land, 5 bushels.

Harvest began about usual time.

Hay.—1 to 1½ ton, according to district; crop light owing to dry weather; quality hardly up to 1894. *Meadow-hay*.—Less productive; grown only in a few parishes.

Potatoes.—6½ to 7 tons ; disease neither so early nor so serious as many previous years ; no new varieties.

Turnips.—14 to 18 tons ; exceptional places quite 20 tons. Braird irregular in some fields, owing to drought, but hardly any resowing.

No injury by insects. Almost no weeds owing to dry season.

Live Stock.—Pastures a good deal burned up till July, and grass scarce. In the latter half of the season pastures were exceptionally luxuriant. Stock thrived well, and were free from disease. *Clip of wool*.—Average.

STIRLINGSHIRE (Western District). *Wheat*.—None grown in this district.

Barley.—Little grown ; yield about 28 bushels ; grain and straw soft and dark in the colour.

Oats.—Under the average ; yield about 29 bushels ; straw short and grain light.

Harvest about two weeks later than usual.

Hay.—Crop very light, about 24 cwt. ; second crop good. *Meadow-hay*.—Light crop and indifferently secured.

Potatoes.—Fair average yield from 7 to 9 tons ; soft in quality ; earlier kinds pretty much diseased.

Turnips.—Very irregular yield ; as a rule light crop. About a half had to be sown a second time from frost and fly.

Considerable amount of injury by fly. No injury by weeds.

Live Stock.—Pastures rather under last year's growth. Stock thrived fairly well, and were free from disease. *Clip of wool*.—Rather under the average.

STIRLINGSHIRE (Eastern District). *Wheat*.—Seed, 4 bushels ; yield, 28 tons grain and 30 cwt. straw. Both straw and wheat very deficient in quantity and quality on account of severe winter.

Barley.—3 bushels sown ; yield, 40 bushels grain and 2 tons straw, which was far too heavy on ground and did not ripen well, so that neither grain nor straw was up to former years.

Oats.—5 bushels sown ; yield, 36 bushels grain and 30 cwt. straw. Very short crop, and grain not milling well.

Harvest about fourteen days late.

Hay.—Quality deficient ; bad hay time ; small crop ; 25 cwt. *Meadow-hay*.—Very small crop.

Potatoes.—Good yield, 7 tons, but early varieties very much diseased, more so after the rain ; no special new varieties.

Turnips.—Very irregular crop ; some fields very good, others very bad, with mildew and finger-and-toe. Swedes, best yellows, late, with some resowing ; 18 tons.

No damage by insects.

Live Stock.—Pastures below average. Stock did not thrive so well as usual, but were free from disease. *Clip of wool*.—Quality and quantity under former years on account of very severe winter.

CLACKMANNANSHIRE. *Wheat*.—28 bushels ; seed sown, 3 bushels ; grain and straw below an average.

Barley.—36 bushels ; seed sown, 3½ bushels ; grain and straw a full average.

Oats.—34 bushels ; seed sown, 5 bushels ; grain and straw below an average.

Harvest fully eight days later

Hay.—18 cwt. to 24 cwt. *Meadow-hay*.—Not grown.

Potatoes.—Earlier, 4 tons ; half diseased ; later varieties a better crop, and free of disease.

Turnips.—18 tons ; very little sown a second time.

Little damage by insects. Annual weeds more than usual in the turnip on account of the late rains.

Live Stock.—Pastures rather dry in the beginning of the season, but abundant afterwards. Stock did well on the grass. Cattle and sheep free from disease. *Wool*.—An average clip.

FIFESHIRE (Eastern District). *Wheat*.—38 bushels; quality good; straw, $1\frac{1}{2}$ ton; seed sown, 3 bushels.

Barley.—32 bushels; quality and quantity under an average; straw, $1\frac{1}{2}$ ton; seed sown, 3 bushels.

Oats.—36 bushels; quality and quantity under last year; straw, $1\frac{1}{2}$ ton; seed sown, 4 bushels.

Harvest begun one week before the usual time.

Hay.—2 tons; quality better than last year. *Meadow-hay*.—Very little grown in this district.

Potatoes.—7 tons; much larger than last year; very little disease, except in early varieties, but few grown in the district. Bruce and Main-crop chiefly grown.

Turnips.—Yellows, 10 tons; swedes, 16 tons; quality good; braided well. Almost no resowing.

No damage by insects or weeds.

Live Stock.—Pastures were of average growth and quality. Stock throve well, and have been free from disease. *Clip of wool*.—Quality good; about an average.

FIFESHIRE (Middle District). *Wheat*.—The yield of this grain will not be more than 24 bushels, and the quality is fair, about an average; but the straw is rather short, and was thinly planted: the weight will not be more than 1 ton. The deficiency in this crop has arisen from various causes. A great part of the breadth sown had rather a wet seed-bed. Then on account of the long protracted frosts of last spring, the land was thawed and covered with water during the day and frozen during the night for a considerable period.

Barley.—The crop of 1895 was the best of all the cereals, although it cannot be called an average crop. The yield will be about 30 bushels. The quality of the grain is also not up to an average, much of it being darkish in colour, and rather under the usual weight per bushel, the wet weather immediately before harvest having darkened the samples; the straw was short; weight about 17 cwt.; quantity sown about 3 to $3\frac{1}{4}$ bushels.

Oats.—This crop was very short in straw, and somewhat thin on the ground; yield, 36 bushels; quality of grain, good. It is fair in colour, and of average weight per bushel; weight of straw not more than 17 or 18 cwt.; quantity sown about 4 to $4\frac{1}{2}$ bushels.

Harvest was nearly general by the first week of September, and may be said to have begun at the usual time.

Hay.—The weight of this crop would not average more than a ton. It was well got, and the quality will be fair. As compared with last year, the crop will be very little more than a third of that of 1894. The great drought during the early part of summer checked the growth of all the crops, and told even more severely upon the hay crop, and that was intensified where, in the spring, sheep had got the first flush of the young grass. *Meadow-hay*.—There is very little, if any, in this district.

Potatoes.—This crop was a very large one, considerably above average; the yield will be from 5 to 7 tons, perhaps fully 6 tons. Some of the early sorts were considerably diseased, such as Regents, Sutton's Abundance; but Bruces, Maincrops, and the later varieties were mainly free. No new varieties planted in the district.

Turnips.—The weight of swedish turnips would be about 17 tons, of yellows about 14 tons. There is a comparatively small breadth of swedes this season, as, on account of the great drought in the end of May, this variety did not braird, and the ground was resown with yellows. There is more than the usual loss by anbury and finger-and-toe. And crows did more damage to turnip fields than I ever remember; on many fields two-thirds of the plants were pulled up and destroyed.

No crops in this quarter were at all damaged by insects, unless it might be amongst turnips; and the crows, hunting after line-worms, pulled the turnips to get the worms. Last year, as in all dry seasons, the crops were more damaged than usual. The worst weed is charlock, or wild mustard.

Live Stock.—The pastures were very bare by midsummer, and did not afford the same amount of food for stock as in an average season. The rains after the end of June helped them somewhat, but still keep was deficient. Stock throve fairly well where keep was sufficient, or pastures yielded a fair bite. Scab amongst sheep has been more than usually prevalent during autumn and winter, the very wet weather neutralising the effects of dipping. The quantity and quality of wool was equal to the average of years.

FIFESHIRE (Western District). *Wheat*.—34 bushels on the good wheat soils round the coast; 28 bushels on the poorer inland soils; $3\frac{1}{2}$ bushels of seed on the good land, and 4 on the secondary. Both straw and grain inferior to last year.

Barley.—40 bushels on the best soils; 32 bushels on the inferior. Same answers as applied to wheat.

Oats.—42 bushels on the best soils; 32 bushels on the inferior; 4 bushels on the good land; 5 to 6 bushels on the poor land. Straw exceedingly short, and grain much inferior to last year.

Harvest round the coast began the last week in August; further back, a week to ten days later.

Hay.—1 ton 10 cwt. on the good land; 1 ton on the inferior; quality very fine. *Meadow-hay*.—Crop much the same as last year.

Potatoes.—5 to 7 tons on the coast lands; 4 to 5 tons inland. A good deal of disease amongst the early varieties.

Turnips.—20 to 25 tons on the finest soils; 10 to 15 tons on the poor soils. The crop brairded well, and little resowing was required.

No injury by insects. The turnip crop was full of weeds of the usual kinds, as on account of the wet weather it could not be got cleaned.

Live Stock.—Pastures were full of clover, and most luxurious the whole season. Sheep did well, but about midsummer the pastures got too dry for cattle, consequently they did no good. Cattle and sheep were free from disease. *Clip of wool*.—Good; about the average.

PERTHSHIRE (South-West District). *Wheat*.—Under an average crop of both grain and straw; about 30 bushels; seed sown, 4 bushels.

Barley.—Above an average crop in bulk; 40 bushels; weight, 53 to 56 lb.; damaged by lodging; seed sown, $3\frac{1}{2}$ bushels.

Oats.—A full average crop; 44 bushels; weight, 42 to 44 lb.; seed sown, 4 to 5 bushels.

Harvest began about usual time; at first broken weather, but cleared up latterly.

Hay.—About 1 ton 10 cwt.; quality fair. *Meadow-hay*.—Under average crop, and not well got.

Potatoes.—A good crop, but about one-half diseased. New varieties, Sutton's, Maincrop, and Bruce. These are likely to take the place of Regents.

Turnips.—A good crop; 20 to 24 tons. Crop brairded well; very little second sowing.

Crops not injured by insects or weeds to any extent.

Live Stock.—Pastures, taking the whole season into account, grazed well. Stock thrive fairly well. Cattle and sheep quite free from disease.

Wool.—A full average clip in quantity and quality.

PERTSHIRE (District of Coupar-Angus). *Wheat*.—The average yield of wheat in this district will be barely up to last year's crop—from 28 to 32 bushels, as against 30 to 36 last year; and the quality of both grain and straw is also a little inferior, owing to the long-continued wet weather before harvest; seed sown, $2\frac{1}{2}$ to $3\frac{1}{2}$ bushels.

Barley.—This crop is also inferior to that of last year, both as to quantity and quality of grain and straw; the average yield of grain will be from 32 to 36 bushels, as against 36 to 40 bushels last year; seed sown, 2 to 3 bushels.

Oats.—Also much below the average of last year, both as to yield and quality of grain, owing to the long-continued drought in the early part of summer, and followed by a long period of wet weather; but the quality of the straw is generally very good, having been secured in good order; average yield of grain will be from 26 to 44 bushels; seed sown, 3 to 5 bushels.

Harvest began this year about the usual time.

Hay.—The crop is below the average of last year as to quantity, owing to the long-continued dry weather in May and June, but the quality is generally good; the yield averages from $1\frac{1}{2}$ to 2 tons. *Meadow-hay*.—There is little or none made in this district.

Potatoes.—The yield of the potato crop is this year much above last year's crop, especially in the Bruce, Magnum, and Maincrop varieties, and the quality also good; but Regents have been almost a total failure through disease. Average yield, 6 to 8 tons.

Turnips.—The crop is much under the average of last year, being very irregular and much affected with finger-and-toe. The crop, unless where very early sown, did not braird well, owing to the very dry weather at seed-time, and second sowings in many cases had to be resorted to. Swedes will not average more than 15 to 20 tons, and yellows 12 to 15 tons.

There was no apparent damage done to crops by insects this year. Where crops were a partial failure, marigolds and other annual weeds grew up and considerably damaged what was left.

Live Stock.—The pastures have been very good during the whole season, and stock thrive well on them. Both cattle and sheep, and also pigs, have been comparatively free of diseases of any kind during the past year; and I hear of no cases of swine-fever in the district. *Clip of wool*.—An average one both as to quantity and quality.

PERTSHIRE (District of Strathearn). *Wheat*.—A fair average crop; about 32 to 34 bushels; not much grown in the district; seed sown, 3 to 4 bushels.

Barley.—An average crop; 35 to 36 bushels; but considerably damaged by wet weather; in many instances much sprouted and deteriorated in colour and quantity, and very difficult to cut; seed sown, $3\frac{1}{2}$ to 4 bushels.

Oats.—An average crop. In early sown lea good quality of grain, but very short in straw; 36 to 38 bushels. Well secured in early, but much damaged in late, districts by lodging and second growth; seed sown, 4 to 5 bushels.

Harvest later than last year by about ten days or a fortnight, principally on account of the wet weather.

Hay.—Fairly good in some cases and very light in others; average yield about $1\frac{1}{2}$ to 2 tons. In early districts well secured, but generally not well got. Well mixed as regards clover and ryegrass, the former predominating. *Meadow-hay*.—Less than an average crop, and less productive than last year. In late districts well secured.

Potatoes.—A splendid crop, and, with the exception of Regents, free of disease; average quantity from 6 to 8 tons. Some new varieties planted, such as Magnums, Bruces, and Maincrops, and with good results.

Turnips.—Under an average crop; about 15 to 16 tons; brairded fairly well, but remained for a long time quite stationary, especially Swedes; yellows damaged in many cases by finger-and-toe, and only half a crop. In many instances not much second sowing required; crop much improved after the July rains.

Crops not much injured by insects; less damage than usual. Little or no injury by weeds.

Live Stock.—Pastures backward in May and June owing to lack of moisture, but much improved and freshened by July rains; aftermath exceedingly good. Stock throve well, and on strong land, where the grass was not burnt up and a little cake was used, were easily fattened for market. Cattle and sheep perfectly free of disease. *Clip of wool*.—About an average, prices rather better than last year in some cases.

PERTSHIRE (Highland District). *Wheat*.—None grown.

Barley.—Crop not good; 32 bushels; weight 52 lb.; wanted sunshine; seed sown, $3\frac{1}{2}$ bushels; straw fair; grain light and bad colour.

Oats.—Crop of lea oats good; 42 bushels; quality of grain and straw as good as last year; seed sown, 5 bushels. Clear land oats not so good, but very much the same as last year; weight 40 lb. per bushel; seed sown, $4\frac{1}{2}$ bushels.

Harvest about a fortnight later, and on the whole good, and soon got.

Hay.—Crop very poor; suffered from severe winter; quantity 10 cwt.; quality not good, and ill got, through much wet. Both suffered through severe winter and dry weather in spring. *Meadow-hay*.—A good crop; much the same as last year. Ill got on lower land; upper land good.

Potatoes.—Yield about same as last year; $4\frac{1}{2}$ tons; a little disease in the earlier kinds, no great extent. No new varieties.

Turnips.—Not so heavy as last year; yield 14 tons; brairded ill in consequence of dry weather; requiring a second sowing.

No injury by insects. Wet weather induced weeds, unless in very clear land. No harm done.

Live Stock.—Pastures not so good as last year, by one-half; too dry spring, and too wet autumn; wintering too soft to last. Stock did not thrive well at first, but improved towards the latter end of the season, and were free from disease. *Clip of wool*.—Quality not so good; wool dry, after severe winter; average not so good as last year.

PERTSHIRE (District of Dunkeld and Stormont). *Wheat*.—Little grown.

Barley.—A short crop owing to drought; grain fair; pretty well harvested; about 30 bushels; weight 54 lb. per bushel; seed sown, 4 bushels.

Oats.—Short in straw; seven weeks without rain from the end of April to the 17th of June; improved on some soils after rain; on sandy and gravelly soils very little; about 42 bushels; 42 lb.; well harvested; seed sown 4 to 5 bushels.

Harvest earlier by a week.

Hay.—Was a very light crop, not more than a half; three-fourths of a ton. It was well secured. *Meadow-hay*.—Little or none. What is of it was nearly lost, rain falling every day almost.

Potatoes.—A very good crop; about 7 tons; a good deal of disease among Regents, and a little among Sutton's; Bruce's free of disease; no new varieties.

Turnips.—Crop turned out fair; about 18 tons. The Swedish braided badly, or not at all, owing to drought, and had to be sown again, mostly with yellow.

Turnips were damaged by turnip-fly. Weeds were very difficult to kill after rain came.

Live Stock.—Pastures were very short and burned up in June, but came away after the rain; quality not first-class. Stock thrived fairly well, better in the dry weather than the wet, and were free from disease.

Clip of wool—Average.

FORFARSHIRE (Western Division). *Wheat*.—32 bushels; quality good; straw deficient; seed sown, 3 bushels.

Barley.—From 24 to 40 bushels; quality would be an average; straw very deficient; seed sown, 3 bushels.

Oats.—From 24 to 60 bushels; quality fair; straw very deficient; seed sown, 4 bushels.

Harvest commenced about a fortnight earlier.

Hay.—Crop would cut 1 ton 10 cwt.; quality good, but very deficient in bulk.

Potatoes.—From 8 to 9 tons of a yield; very little disease, which commenced late in the season; no new varieties planted.

Turnips.—About 24 tons. The crop braided very badly, some seed lying for six weeks. A good deal of second sowing had to be done, because the soil was so devoid of moisture that there was not enough to cause the seed to germinate.

No damage from insects. Some crops were injured by weeds, such as cereals, where the weeds got a start before the crop itself—mostly annual weeds.

Live Stock.—Pastures were short in the early part of the season, but very abundant at the close. Stock thrived, and were free from disease.

Clip of wool—The quality was good, and it would be quite an average.

FORFARSHIRE (Eastern Division). *Wheat*.—28 bushels; quality of grain good; straw very short; seed sown, 3 to 4 bushels.

Barley.—32 bushels; quality inferior; straw very short; seed sown, 3 to 4 bushels.

Oats.—42 bushels; quality good; straw very short, but good quality; seed sown, 4 to 5 bushels.

Harvest began about usual time (30th August).

Hay.—Crop 30 cwt.; quality very poor. *Meadow-hay*—None in this district.

Potatoes.—Crop 10 tons; no disease, except among Regents and Champions; a few new varieties tried and turned out well.

Turnips.—Crop 25 to 30 tons; Swedes 18 to 20 tons, where a braird did not come at once.

No injury by insects. More weeds than usual, but crops not injured where care taken.

Live Stock.—Pastures during the season were not of average growth and quality with last year—too dry first part of season, then too much wet. Stock thrived middling. Cattle and sheep free from disease.

Clip of wool—Good quality, and about average.

ABERDEENSHIRE (District of Buchan). *Wheat*.—Not grown in this district.

Barley.—Barley and bere good crop, both of grain and straw, and would

be fully better than last year's crop ; 40 bushels would be a fair average, weighing from 53 to 55 lb. ; seed sown, 4 to 4½ bushels.

Oats.—The crop is better than that of last year, and, having been better secured, the grain is of a more uniform quality ; weight from 40 to 44 lb. ; quantity 36 to 44 bushels ; seed sown, 6 bushels.

Harvest commenced about the beginning of September, and was finished about the end of the month, about a week earlier than the previous year.

Hay.—The crop was not so good as last year's one. This is due to the continuance of dry weather before cutting, although it looked to be a good crop during the first half of the season ; quantity from 1¼ to 1½ ton.

Meadow-hay.—Very little grown in the district.

Potatoes.—A very much better crop than that of last year, and mostly free from disease ; also of very good quality.

Turnips.—The crop is not equal to last year's ; the Yellows would not average more than 16 and the Swedes not over 20 tons. There was a good deal of resowing owing to the dry weather.

No damage was done by insects to any extent. No injury by weeds.

Live Stock.—Pastures were not so luxuriant nor so good a growth as last year. Cattle and sheep did well on the grass, and were free from disease. *Clip of wool*.—About the same as last year's, but low in price.

ABERDEENSHIRE (District of Formartine). *Wheat*.—None grown in this district.

Barley.—Crop last year 38 bushels ; this year 33 bushels ; straw 15 per cent less than last year ; seed sown, 4 bushels.

Oats.—Crop last year 40 bushels ; this year 37 bushels ; straw 10 per cent less than last year ; seed sown, 5½ bushels, but upon the higher lands 6½ bushels.

Harvest about one week earlier than the usual time.

Hay.—"Seeds"—i.e., ryegrass and clover mixed—are cut for hay in this district ; last year 1 ton 15 cwt., this year 1 ton 5 cwt. ; quality excellent both seasons. Clover was more deficient than ryegrass. *Meadow-hay*.—Practically none grown here.

Potatoes.—Crop last year 4 tons, this year 6 tons 10 cwt. ; little disease.

Turnips.—Crop last year 23 tons, splendid quality ; this year 16 tons, poor quality, and more than the usual amount of disease (finger-and-toe). The crop brairded badly owing to drought, and a good deal of second sowing was required. Feeding-cattle have not made so much progress as usual on turnips, therefore, I think, even where sound, the roots must be of poor quality.

Turnip braird was injured by the turnip-fly rather more than usual ; other crops uninjured. Usual injury to crops was caused by couch-grass, knot-grass, and skellach.

Live Stock.—Pastures were exceptionally good both seasons, in growth and in quality. Stock thrived very well, and were free from disease.

ABERDEENSHIRE (District of Garioch). *Wheat*.—None sown in the district.

Barley.—In most cases a bulky crop, though the grain, both in quantity and weight, is rather under the usual return—40 bushels, weighing 54 lb., may be quoted as an average for this district ; seed sown, 4 bushels.

Oats.—This crop, especially that after turnips, was retarded in brairding by the dry weather in May and first half of June, and in some cases the ripening was very unequal. The moist weather during the summer forced the crop on to a good average, which in other circumstances must have been a short one. Although as regards bulk it is less than last year, the yield is satisfactory, 42 bushels, weighing 42 lb., being about an average ; seed sown, 6 bushels.

Harvest.—The cutting of both barley and oats was commenced about 30th August, which is about the usual date.

Hay.—The crop was practically a failure; the ryegrass was thin and wiry, and the clover was altogether wanting. There would certainly be less than half the weight there was last year.

Potatoes.—An average crop, and free from disease. There were no new varieties planted.

Turnips.—22 tons 14 cwt. Swedish, and 18 tons 14 cwt. Yellows, are the figures given as the average weights of turnip crop on the farms included in the Garioch Turnip-Growing Association; but those would be above the average for the district. The quality, especially as regards Swedish turnips, is very good, though finger-and-toe is noticeable amongst the Yellows. Owing to the dry state of the soil the crop was slow in brairding, and resowing was very common.

No damage was done to the crops either by insects or weeds.

Live Stock.—Pasture in the early part of the season was very scarce; but, notwithstanding, cattle throve better then than later on, when, the weather becoming rainy, food was more abundant. There has been no disease in this district. *Clip of wool*.—About an average one.

ABERDEENSHIRE (District of Strathbogie). *Wheat*.—None grown.

Barley.—Hitherto there has not been much barley grown, but within the last year or two, since the price of oats fell so much in value, and also as many farmers are going in for a divided crop, the area under cereal appears to be on the increase. The crop was satisfactory as regards straw, but the yield of grain is deficient; perhaps a little over 32 bushels may be stated as a fair average; the weight of the grain would average just about 54 lb.

Oats.—This crop after lea was generally a satisfactory one, but after roots deficient, both in straw and grain. The average return may be given about 34 bushels, and the weight of the grain from 40 to 42 lb.

Harvest began about the usual time, but owing to wet weather leading was delayed, so that on the whole the length of time required to secure the crop was more than is generally necessary in a fairly good year.

Hay.—This crop was remarkably poor, indeed in many cases it would not bulk over half an average; clover somewhat deficient, as it generally is when the season is rather cold.

Potatoes.—The crop was unusually abundant and the quality excellent; there was no disease. Maincrops are becoming very popular, being a good cropper and at least ten days earlier than the Champion variety, which has been a favourite for many years.

Turnips.—Have been a good crop, and no trouble whatever in brairding. Unfortunately a remarkably heavy thunderstorm, accompanied by a good deal of hail and rain, did a great amount of damage to a few brae-set fields. Messrs Webb, seedsmen, Stourbridge, have been supplying turnip seeds for a few years to a good number of farmers, and the results have been eminently satisfactory, both as regards the quality of the roots and the bulk of the crop.

Live Stock.—The pastures generally were of average growth, but complaints were frequently heard of the stock not thriving in a satisfactory manner. Cattle and sheep have both been free of disease. *Clip of wool*.—Owing to the severity of the winter of 1895 the quality was generally deficient. Indeed in many cases there were great complaints of the deficiency in weight, and this was particularly the case in regard to hill flocks, which probably had suffered more from the snow and frost.

BANFFSHIRE (Lower District). *Wheat*.—None grown here.

Barley.—A good crop, 32 to 42 bushels, of good colour and weight; seed sown, 3 to 4 bushels.

Oats.—Good average crop both as regards grain and straw; 40 to 48 bushels; seed sown, 5 to 6 bushels.

Harvest began on 23d August, being a week earlier than usual, and of an average duration.

Hay.—A much lighter crop than last year, and also of inferior quality; 20 to 30 cwt. *Meadow-hay*.—Little, if any, grown.

Potatoes.—A very heavy crop, of excellent quality; 6 to 9 tons. More than double of last year's crop. No disease; no new varieties.

Turnips.—20 to 36 tons; an average crop, of good quality; braided well; very little second sowing.

Not much appearance of insects. Great difficulty experienced in keeping down the weeds on account of the wet weather. Damage greater than usual.

Live Stock.—Pasture an average growth and quality, and stood well out in the end of the season. Stock thrived well, and were free from disease.

Clip of wool.—A full average.

BANFFSHIRE (Upper District). *Wheat*.—None grown in this high district.

Barley.—3 quarters 5 bushels; quality of grain and straw superior to last year; seed sown, 4 bushels.

Oats.—Quantity 26 bushels; quality of half the grain and half the straw in about half of the district inferior to last year, being damaged in stack by frost and snow; seed sown, 6 bushels.

Harvest was about two weeks late.

Hay.—Quantity and quality inferior to last year; quantity about 1 ton 13 cwt. *Meadow-hay*.—None.

Potatoes.—Quantity about 3 tons 10 cwt.; quality fair; some disease; no new varieties.

Turnips.—Weight about 16 tons; quality good, and better than last year. Braird came away well, and no second sowing.

Grub bad in some lea fields, and did much damage, more than usual. No injury by weeds.

Live Stock.—Pastures an average. Stock thrived fairly well, and were free from disease. *Clip of wool*.—Quality only fair; crop poor, and under an average.

MORAYSHIRE (Lower District). *Wheat*.—Every year the quantity sown is growing less. Many people who stuck to wheat after it had ceased to be a paying crop are now abandoning it. Great variety both in yield and quality was seen in the few wheat fields of 1895. Some were dark in colour, others took on the golden yellow very fairly. Bulk was fair; and about 40 bushels might be about average return.

Barley.—A very fine crop. In some cases too heavy, with a good deal of lodging. Not so bad in this way, however, as in 1894. Lodging was at a later stage of growth, and thus filling was not so much interfered with. Weight and quality are both better this year; 55 lb. might be about average; yield fully 40 bushels.

Oats.—Very fine crop. Moist season suited it. Bulk large; straw strong, but fresh and good; quality of grain excellent; yield would average 48 bushels.

Harvest began about the usual time (20th August), and was a fairly good one; weather a little unsteady at first, but improved afterwards.

Hay.—This crop unusually light. A cold month of May checked its growth very much, especially where it had been eaten bare in March or April by sheep. A mild moist season afterwards did not recover it;

average would not exceed 25 cwt. *Meadow-hay*.—This part of country has scarcely any.

Potatoes.—Splendid crop. Nearly double the return of last year; average would reach 8 tons; in some cases 10 tons were grown fully. No disease to speak of in stronger varieties. Round early sorts suffered somewhat. Magnums the chief marketable potato. Bruce's coming in also, and Maincrop, Sutton's Abundance, &c.

Turnips.—Very fine crop; average would be up to 24 tons, more than double last year, and quality excellent. Crop braided very well. Some failures occurred, but very few, and they afterwards recovered.

Very little damage by insects—considerably less than usual. Weeds were difficult to kill. Turnips grew fast, and weather was often damp; but farmers who were active got their fields fairly well cleaned.

Live Stock.—Rich pastures and a poor crop of hay were seen alongside of each other, why, no one could satisfactorily explain. Pastures were good in both of the past two years. This year they continued rich well down into the autumn. Stock did very well, but did not quite make the progress that the richness of the pastures led farmers to expect; still they came into the wintering in good condition. Cattle and sheep were free from disease. *Wool* of excellent quality—better than last year; and the *clip* was large.

NAIRNSHIRE. *Wheat*.—None.

Barley.—32 bushels; quality about the same; seed sown, 3 to 4 bushels.

Oats.—40 bushels; equal to last year; seed sown, 5 to 6 bushels.

Harvest a week later.

Potatoes.—Yield fully double last year; a little disease.

Turnips.—16 to 20 tons; came up well; only once sown; a good deal of finger-and-toe.

No injury by insects.

Live Stock.—Pastures during the season of average growth and quality with last year. Stock thrived fairly well, and were free from disease.

INVERNESS-SHIRE (District of Inverness). *Wheat*.—None sown in 1895.

Barley.—Was a very heavy crop on the best cultivated lands; but the yield was scarcely an average as regards quantity; while the natural weight was in many instances under the standard; seed sown, about 3½ bushels.

Oats.—The crop was quite an average one, both as regards quantity and quality. In many cases the straw was lodged, but little damage was done to either straw or grain; average return on best soils 40 to 50 bushels, and on poor soils about 30 bushels; seed sown, 3 to 5 bushels.

Harvest was quite up to an average of seasons. The early part was somewhat broken with showers, but on the whole was a favourable one. The weather was very calm during the ingathering of the crops, and but very little damage was done from heating.

Hay.—The quantity was similar in yield to former year; while the quality was superior. Larger breadths of hay have been grown in recent years in this county in consequence of the unremunerative price for stock, and the price of hay is in consequence very low. *Meadow-hay*.—None grown.

Potatoes.—The yield of this crop was about an average; while the quality was superior to 1894. There was very little disease among the tubers. There were a few new varieties planted, some of which promise to give good results.

Turnips.—There was an excellent crop on most farms, and the quality satisfactory, there being less canker or finger-and-toe than usual. The crop braided well, and no second sowing resorted to.

There was no injury caused by insects to any crops grown. The usual weeds were prolific, except where there were heavy crops.

Live Stock.—Pasture-grass was about an average; and stock thrived pretty well during the season. Cattle and sheep have been quite healthy. *Clip of wool*.—An average.

INVERNESS-SHIRE (Island of Skye). *Wheat*.—None.

Barley.—None.

Oats.—A good return throughout the island, probably up to 36 bushels; 6 bushels generally sown; straw very good.

Harvest began about the usual time.

Hay.—Of much the same quality and quantity as last year. *Meadow-hay*.—About the same.

Potatoes.—The potato crop varied very much, but was good in some places. There was no disease. Not aware of any new varieties having been planted.

Turnips.—Quality was a good average; weight varied much; did not braird well owing to drought. In some places a second sowing was required.

Not aware of much injury by insects. Not much injury by weeds—rather less than usual.

Live Stock.—The pastures were better than usual, as to growth and quality especially, towards the end of the season. Stock thrived very well. Cattle and sheep perfectly free from disease. *Clip of wool*.—Above the average, and of excellent quality.

INVERNESS-SHIRE (Lochaber). *Wheat*.—None grown.

Barley.—Almost none grown.

Oats.—Yield of grain about 4 bushels below last year; straw also about same as last year; seed sown, 6 bushels.

Harvest began about usual time.

Hay.—The quantity of hay was about 15 cwt. below last year's crop; and the quality, where got in, was inferior owing to excessive wet during hay-making. *Meadow-hay*.—More; a good crop.

Potatoes.—Yield heavier in 1895, probably about 3 tons; not much disease; some complaints of smallness of tubers; this was probably due to the effects of a frost early in June. No new varieties.

Turnips.—About 4 tons above last year's crop in weight; brairded well; no second sowing required.

No injury by insects or weeds.

Live Stock.—Pastures below average growth and quality. Stock did not thrive so well, milch cows especially. The theory extensively prevails that pastures were injured by the very severe as well as very protracted frost of the winter 1894-95. Cattle and sheep free from disease. *Clip of wool*.—Under average according to experience of most flock-masters, probably also due to the exceptional severity of the winter 1894-95.

ROSS-SHIRE (Western District). *Wheat*.—None sown.

Barley.—Little or none sown.

Oats.—Average crop; 32 bushels; fully better than last year; seed sown, 6 bushels.

Harvest fully a fortnight later.

Hay.—1 ton; quality good. *Meadow-hay*.—More productive.

Potatoes.—Yield 5 tons, about 1 ton less than last year; little or no disease; no new varieties planted.

Turnips.—12 tons; quality better; brairded well; no second sowing.

No injury by insects or weeds.

Live Stock.—Pastures fully an average growth. Stock thrived well.

Cattle and sheep free from disease. *Clip of wool*—Good; fully an average.

ROSS-SHIRE (Districts of Dingwall and Munlochy). *Wheat*.—Quantity under average, quality also; very few acres grown in the district last season.

Barley.—Quantity and quality again below average, say 26 to 32 bushels; straw average in quantity and quality.

Oats.—Quantity full average, but quality below, say 36 to 40 bushels; straw abundant, quality not average.

Harvest began on 19th August, or about the usual time. It was rather tedious owing to unsettled weather.

Hay.—The quantity was barely average, especially of ryegrass; clovers were more abundant; the quality was much impaired by wet weather; say $1\frac{1}{2}$ tons.

Potatoes.—Quantity about average; early varieties were diseased to the extent of one-third of bulk; later varieties did not come to full maturity, owing to growthy weather, followed by frost early; say 5 tons; disease appeared in end of July.

Turnips.—Swedes fully better crop than last season, say 22 to 24 tons; yellows again variable, say 10 to 15 tons. Finger-and-toe not nearly so prevalent; crop in general braided well, but there was a good deal of re-sowing on strong land.

No injury by insects. Birds very destructive. Not more than usual damage by weeds.

Live Stock.—Pastures were very late in giving a full bite, owing to the severe frost of spring; latterly the growth was abundant. Stock thrive about as well as usual, and were free from disease. *Clip of wool*—Average.

ROSS-SHIRE (District of Tain, Cromarty, and Invergordon). *Wheat*.—Considerably less than last year, and thin on the ground owing to the severe frost; $3\frac{1}{2}$ quarters; seed sown, 3 to 4 bushels.

Barley.—Deficient crop; thrashed out very badly; fair quality, but light weight, under 4 quarters; seed sown, 3 to $3\frac{1}{2}$ bushels.

Oats.—The same remarks apply to oats, except on warm bank land; under average; 4 to $4\frac{1}{2}$ quarters.

Harvest began about average time, 20th to 25th August.

Hay.—20 per cent under last year; better quality; about $1\frac{1}{2}$ tons.

Meadow-hay.—None grown.

Potatoes.—One-third more; no disease; no new varieties; 7 to $7\frac{1}{2}$ tons.

Turnips.—Better than last year; braided well; a little second sowing owing to fly; 20 to 22 tons swedes, 17 to 20 tons yellow.

No damage by insects. Crops injured to a considerable extent with couch-grass; more than usual.

Live Stock.—Pastures quite of average growth and quality. Stock did not thrive quite up to the average; season cold. Cattle and sheep quite free from disease. *Clip of wool*—Slightly over average.

CAITHNESS-SHIRE. *Wheat*.—Not grown.

Barley.—30 bushels; seed sown, 4 bushels; quantity, owing to drought in some parts of county, less, the yield being irregular; quality very good, and well secured.

Oats.—Quantity from some cause irregular, say 36 bushels; quality good and weighing well; straw short on the north and west coasts.

Harvest about ten days earlier than usual.

Hay.—Crop under last year by one-third; quality fair. *Meadow-hay*.—Average crop.

Potatoes.—An excellent crop of some 6 to 7 cwt.; clear of disease, and good quality.

Turnips.—This crop irregular, some fields over 30 tons, while on others half that quantity; a good deal of finger-and-toe. The braird came away all right, but got stunted for want of rain in July.

No injury by insects. Weeds we have always with us, though not more than usual this season, except thistles, which were very abundant.

Live Stock.—Pastures an average. Stock throve fairly well until the close of the year. No disease except rot on the wet lands. *Wool*.—A better clip of good quality.

ORKNEY. *Wheat*.—None.

Bere.—The average yield was about 36 bushels, weighing about 49 lb.; seed sown, $3\frac{1}{2}$ to $4\frac{1}{2}$ bushels.

Oats.—A good crop, and secured in good order; average yield about 34 bushels; weight about 41 lb.; straw rather less than last year, but about an average bulk; seed sown, 4 to 6 bushels.

Harvest commenced in the second week of September, being about the usual time, although a week later than last year.

Hay.—A heavy and abundant crop; weight about 30 cwt.

Potatoes.—This crop bulked well, being about double the yield of last year. In some districts they were somewhat diseased; average 7 to 8 tons.

Turnips.—This crop brairded well. There was some finger-and-toe, but there is nevertheless a good crop; average about 12 tons.

There was little damage done by insects or weeds.

Live Stock.—Pastures were good all year, and stock throve well and were free from disease. *Clip of wool*.—A good average.

SHETLAND (Island of Unst). *Wheat*.—None grown.

Barley.—Straw heavy, but grain light, owing to wet season.

Oats.—This crop pretty heavy in the straw, but light in grain, owing to sunless season.

Harvest began about the usual time.

Hay.—This crop was much heavier than last season's, and above an average, but suffered from wet in curing. *Meadow-hay*.—Crop about an average; on wet ground lighter than last year, on dry ground heavier.

Potatoes.—This crop on wet ground a total failure; on dry ground a light crop, and much affected by disease, commencing in August.

Turnips.—This crop fully an average, and free from disease; braird early and strong; only one sowing required.

No damage to crops by insects. No abnormal growth of weeds.

Live Stock.—Pastures much better than last year; grass rich and plentiful throughout the season. Stock throve very well, and were free from disease. *Clip of wool*.—Quality very good; about an average.

SHETLAND (District of Lerwick). *Wheat*.—None grown.

Bere.—More straw than last year, but less grain, and quality not so good.

Oats.—Grain very defective in quantity and quality; more straw than last year.

Harvest began about usual time, but later than last year.

Hay.—Quantity more of both, but quality not so good as last year.

Meadow-hay.—More productive than last year.

Potatoes.—Yield generally not so good as last year; slightly diseased. No new varieties planted.

Turnips.—Weight not equal to last year, but quality generally good; braird good; one sowing.

No injury by insects. No injury by weeds.

Live Stock.—Pastures above the average, both growth and quality. Stock did well, and were free from disease. *Clip of wool*.—Good over the average.

THE METEOROLOGY OF 1895.

The following table gives a comparison of the winds, temperature, rainfall, and sunshine of 1895 as compared with the averages of previous years:—

TABLE SHOWING FOR WIND DIRECTION AND FORCE, MEAN TEMPERATURE, RAINFALL, AND SUNSHINE, THE EXCESS ABOVE, OR THE DEFECT FROM, THE AVERAGES OF PREVIOUS YEARS FOR ALL SCOTLAND.

| | DIRECTION OF WINDS—DAYS. | | | | | | | | | Wind Force. | Rainfall. | Mean Temperature. | Sunshine. |
|-------------|--------------------------|------|----|------|----|------|----|------|--------|-----------------------|---------------|-------------------|-----------|
| | N. | N.E. | E. | S.E. | S. | S.W. | W. | N.W. | Gales. | | | | |
| | — | — | — | — | — | — | — | — | — | | | | |
| January . | 4 | 2 | 2 | 0 | -2 | -5 | -3 | 2 | 0 | lb. per sq. ft. -0.48 | inches. -1.17 | ° -6.3 | hours 0 0 |
| February . | 2 | 0 | 2 | 0 | -1 | -3 | -1 | 0 | 1 | -0.84 | -1.86 | -9.4 | 13 |
| March . | 1 | 0 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | -0.11 | 0.77 | 0.2 | 37 |
| April . . | 0 | 0 | -1 | -1 | 1 | 1 | 0 | 0 | 0 | 0.09 | 0.01 | 1.0 | 21 |
| May . . | -1 | 0 | 0 | 1 | 1 | -1 | -1 | 0 | 1 | -0.18 | -1.39 | 2.8 | 15 |
| June . . | 1 | 0 | -1 | -1 | 0 | -1 | 1 | 1 | 0 | -0.16 | -0.35 | 0.2 | 1 |
| July . . | 1 | 0 | 0 | 0 | 0 | -1 | -1 | 1 | 0 | 0.31 | 1.24 | -1.6 | 64 |
| August . | -1 | 0 | -1 | -1 | 1 | 2 | 1 | -1 | 0 | 0.09 | 1.67 | 1.2 | 60 |
| September . | -1 | -1 | -2 | 0 | 1 | 1 | 1 | 0 | 1 | -0.22 | -1.92 | 4.4 | 8 |
| October . | 2 | 2 | -1 | -2 | -1 | -2 | 0 | 2 | 0 | 0.38 | 0.55 | -3.6 | 1 |
| November . | -2 | 0 | 2 | -1 | 1 | 1 | 0 | -1 | 0 | 0.27 | 0.62 | 1.2 | 19 |
| December . | -2 | 0 | 3 | 3 | 0 | -3 | -1 | 0 | 0 | 0.78 | 0.41 | -0.4 | 26 |
| Year . . | 4 | 3 | 2 | -2 | 1 | -11 | -4 | 4 | 3 | 0.00 | -1.42 | -0.9 | -191 |

Hence, for Scotland taken as a whole, the year 1895 was characterised by a deficiency of S.E., S.W., and W. winds, amounting to seventeen days in all, and an equal excess of winds from N.W., N., N.E., and E. The excess of these northerly winds occurred chiefly in January and February, and these were the two coldest consecutive months that have occurred in Scotland during at least the previous 131 years, over which our meteorological records extend. The year will also be remembered for the singularly fine weather of September, with its bright sunshine and high temperature—a temperature which, during the above long period, has been exceeded only by the Septembers of 1780, 1795, 1843, and 1865. For the whole year the mean temperature was above the average in no other districts but the southern Hebrides, whereas in Galloway and the south of Ayrshire it was a degree and a half less

than the average. Owing to the unusually frequent rains with north-easterly winds, the year's rainfall was above the average only along the south foreshores of the Firth of Forth, the Moray Firth, and the Pentland Firth. On the other hand, the rainfall was fully a fourth part deficient at many places in the west from Skye to the Solway. As in the previous year the sunshine was markedly deficient.

JANUARY.—The mean temperature of the month was $30^{\circ}8$, or $6^{\circ}3$ under the mean, the days being $5^{\circ}7$ and the nights $7^{\circ}0$ less than the average. The greatest deficiencies from their mean temperatures were about $9^{\circ}5$ at Braemar, Kingussie, Broomlands, and Stobo Castle; and about $8^{\circ}5$ at Wolfelee, Glenlee, North Esk Reservoir, Stronvar, Fort-Augustus, and Glen-carron. Thus the great cold was most severely felt among the valleys of inland situations. For combined dryness and cold, the month exceeded all the previous forty Januarys, the January of 1881 alone showing a lower mean temperature; but the dryness of that month was not so great. The distribution of the barometric pressure was peculiar, being relatively higher at northern than at southern, and at western than at eastern stations, and from this resulted an unwonted predominance of winds from N.W., N., N.E., and E., which prevailed ten days more than the average. The direct consequence was the extraordinary severity of the weather of the month. The cold was much less severe at stations near the coast.

The mean rainfall was 2.76 inches, or 30 per cent under the average, but its distribution over the country was most unequal. Over all inland and western districts it was under the average, and very greatly so to the west of a line drawn from the head of the Solway to Loch Broom, where at many places less than a fourth part of the month's average was collected. On the other hand, at eastern, but particularly north-eastern, stations, which lay exposed to the northerly and easterly winds, the precipitation, chiefly in the form of snow, was very large. The great excesses above the averages were, in percentages, 127 at Logie Coldstone, 118 at Gordon Castle, 104 at Boyndie, and 102 at Duns Castle. The heavy snowfalls occurred from the 13th to the 18th.

FEBRUARY.—The weather of this month was a continuation, even more severe, of the weather of January. The mean temperature was $29^{\circ}0$, or $9^{\circ}4$ under the average; the days being $7^{\circ}4$ and the nights $11^{\circ}4$ colder than the average. The clear skies, comparative calmness of the air, and prevalence of north-easterly winds were largely instrumental in bringing about this exceptionally low mean temperature, which is absolutely

the lowest recorded for all Scotland during the last forty years. The greatest frosts, just as in January, were in inland situations among the valleys. The following are the places at which temperature fell to the greatest extent below the average: Kingussie, $13^{\circ}6$; Braemar, $13^{\circ}3$; Stobo Castle, $12^{\circ}9$; Glenlee, $12^{\circ}8$; Broomlands, $12^{\circ}2$; Drumlanrig, $11^{\circ}7$; and Perth, $11^{\circ}5$. But the weather was less severe in the Northern and Western Islands, where the depression below the average was only $4^{\circ}0$. At many places temperature repeatedly fell below zero. At Braemar on the 11th a temperature of $-17^{\circ}0$ was recorded, which is further noteworthy as being absolutely the lowest temperature hitherto observed in any month, or anywhere in the British Islands, with a properly protected thermometer.

The mean amount of the rainfall and melted snow was 1.17 inch, or 62 per cent under the average. In the inland districts of Aberdeenshire it was above the average to the extent of 96 per cent at Haddo House, 38 per cent at Tillypronie; but at the adjoining stations of New Pitsligo and Logie Coldstone it fell only 7 per cent below their averages. In all other parts of the country precipitation was small, being very greatly under the average. Over nearly all the western slopes of Scotland the amounts collected varied only from 2 to 20 per cent of the February average.

MARCH.—The mean temperature was $39^{\circ}6$, or nearly the average, the days being $0^{\circ}3$ below, but the nights, owing to the clouded skies, $0^{\circ}7$ above it. For some distance on each side of a line drawn from Aberdeen to Rothesay, temperature was distinctly higher than it was to the north and south of it—a number of stations showing nearly a degree of excess. On the other hand, over the north-western districts, inclusive of Orkney and Shetland, and Ayrshire and Galloway, temperature was nearly half a degree short of the average. The first four days were cold, but thereafter the great frost gave way, and mild weather generally ruled to the end of the month.

The mean rainfall was 3.55 inches, or 27 per cent above the average. It was under the average in Orkney, the southern half of the Outer Hebrides and coast of Inverness-shire opposite; and in the central districts of Scotland, indicated by a line passing from Braemar through Ochertyre, Glasgow, and Drumlanrig to Dumfries. In all other districts the rainfall was above the average. The excess was very large in many parts of the counties of Inverness, Nairn, Moray, Banff, and Aberdeen, and also in the counties of Mid and East Lothian and Roxburgh. At Wolfelee, North Esk Reservoir, Keith, and Cawdor more than double the average of the month was collected.

APRIL.—The mean temperature was $45^{\circ}1$, or $1^{\circ}0$ above the average, the days being $1^{\circ}4$, and the nights only $0^{\circ}7$ in excess. Everywhere the excess was markedly greater at inland than at coast stations. On the one hand, in Perthshire, Lanarkshire, and Renfrewshire, the excess exceeded two degrees, but along the east coasts it was only half a degree; and at Monach and in Shetland the temperature was a degree below the mean.

The mean rainfall was 2.16 inches, being the average of April, but the amounts distributed over the different districts were very irregular. Over the whole of the eastern slope of the country it was under the average; and also over considerable portions of Galloway, the general deficiency from the Moray Firth to the Cheviots being 50 per cent, rising at Stobo Castle to 75 per cent. Elsewhere the rainfall was above the average. In Orkney, South Hebrides, Skye, mainland adjoining, and over a wide area, including Fort-William, Dalnaspidal, Stronvar, and Inveraray, fully a half more than the average fell. The rain fell mostly during the first ten and the last ten days of the month; and during the first ten days hail fell at intervals.

MAY.—The mean temperature was $51^{\circ}8$, or $2^{\circ}8$ above the average, the excess of the days being $4^{\circ}7$, but of the nights only $0^{\circ}9$, being occasioned by the less cloud and longer and stronger sunshine which prevailed. Again it was in inland districts where the greatest excess of temperature occurred, amounting there generally to from $3^{\circ}5$ to $4^{\circ}5$. Along the east coast from Berwick to Peterhead the excess was about a degree and a half; from Boyndie to Dunrobin two and a half degrees; and in Shetland about a degree. On the other hand, along the whole of the west coasts from Cape Wrath to the Mull of Galloway, temperatures were from $3^{\circ}0$ to $3^{\circ}5$ above the average.

The rainfall was only 0.90 inch, or 61 per cent under the average. Nowhere did the amount reach the average, the nearest approach being at Inverness and the immediate neighbourhood. In all other districts the amounts were considerably under the average, and to the south of the Grampian Range very greatly so. Over wide districts less than a fourth part of the usual rainfall was collected. Thunderstorms were remarkably frequent, and it was with these thunderstorms that most of the rain fell.

JUNE.—The mean temperature was $55^{\circ}0$, being nearly the average, the days being $1^{\circ}7$ above the average, and the nights $1^{\circ}4$ below it. Owing to the excess of north-easterly winds, temperature was much lower at eastern than at western stations. Thus, from Aberdeen to Boyndie, temperature was half a degree

under the average, whereas in the west and south-west, from Barrahead to the Solway, temperature was at many places about two degrees above the average. A spell of cold weather prevailed during the third week; but, on the other hand, unwontedly high temperatures for the season ruled during the last six days of the month, Scotland being at the time on the north side of a large anticyclone.

The mean rainfall was 2·14 inches, or 14 per cent under the average. Its distribution over the country was exceedingly irregular, the extremes being 85 per cent under the mean at Drumlairig, and 155 per cent above it at Keith. The rainfall was above the average in Shetland, Orkney, and to the north and east of a line from Thurso round to Fort-Augustus, Braemar, and thence to Aberdeen; and also generally in Mid and East Lothian and Berwickshire. To the south of the Moray Firth the fall was excessively heavy, being above the average in percentages: 155 at Keith, 147 at Drumnadrochit, 131 at Gordon Castle, 117 at Cawdor, and 110 at Cromarty and Forres. South of the Firth of Forth the greatest excess was 37 per cent at Edinburgh. In all other parts of the country the rainfall was under the average; the totals in many cases were less than a fourth part of the average over the south-west of Scotland, the greatest deficiency being at Drumlairig, Glenlee, the Mull of Galloway, and Quinish, and in the south of the Hebrides.

JULY.—The mean temperature was 55°·5, or 1°·6 under the average, the days being 2°·1 and the nights 1°·2 less than the mean. The low temperature was occasioned by the greater amount of cloud, the marked deficiency of sunshine, and the excess of northerly winds. The distribution over the country was peculiar, temperature being half a degree in excess of the average in Shetland and at the coast stations from the mouth of the Tay to the mouth of the Tweed. In all other parts of the country temperature was under the average, the greatest deficiency being at inland stations, and at western and south-western stations, amounting at many places to about 2°·0.

The mean rainfall was 4·37 inches, or 40 per cent above the average. It was under the average in Wigtownshire; over a district of considerable breadth, extending from Kyleakin to Forres; and Orkney and Caithness. The greatest deficiency was in Orkney, where only half the average amount was collected. In all other parts of the country it was above the average, the greatest excess, 75 per cent, being in the south Hebrides, in the south of Galloway, and in the counties of Roxburgh and Berwick. In the other districts of excess it only amounted to from a fifth to a third.

AUGUST.—The mean temperature was $57^{\circ}8$, or $1^{\circ}2$ above the average, the days being $0^{\circ}6$ and the nights $1^{\circ}8$ in excess. The relatively low temperature of the days was caused by cloud and by a great deficiency of sunshine, in this respect resembling the weather of July; but the three days' excess of southerly winds raised the mean temperature $2^{\circ}3$ above that of July. From the Pentland Firth to the Grampians, and from the Forth to the Tweed, the excess was nearly two degrees, whereas in the south-west it scarcely amounted to a degree.

The mean rainfall was 5.22 inches, or 47 per cent above the average. Over Orkney, Caithness, the greater part of Sutherland, and the coasts of the Moray Firth from Tain to Fraserburgh, it was under the average, the deficiency being from a fifth to a half. In all other parts of the country the rainfall was in excess of the average, and very greatly so over wide districts. The following are the largest excesses, in percentages, above the averages: 158 at Dollar, 136 at Perth, 134 at Inveraray, 108 at Bressay, and 102 at Turnberry and Rona. Daily rainfalls from one to nearly two inches are reported from many stations; and at Edinburgh 0.86 inch fell during the 52 minutes ending 5.7 A.M. of the 22d.

SEPTEMBER.—The mean temperature was $57^{\circ}2$, or $4^{\circ}4$ above the average, the days being $5^{\circ}3$ and the nights $3^{\circ}4$ in excess. The outstanding feature in the meteorology of the month was in the fact of Scotland lying on the western side, or in a few cases on the north-western side, of the anticyclones that occurred, which resulted in the very high temperature of the month. The above high temperature, $57^{\circ}2$, has been only once exceeded in September during the past forty years—viz., in 1865, when the mean was $58^{\circ}0$. The excess of temperature was pretty evenly distributed over the whole of Scotland. Between the Grampians and the Moray Firth it was, however, a little higher than elsewhere. Heavy dews were of frequent occurrence, and these, with the calm weather which frequently prevailed, were not favourable for the stacking of the cut grain.

The mean rainfall was 1.75 inch, or 52 per cent under the average. Over a small restricted patch of country, bounded by a line passing through Barrahead, Rona, Isle Ornsay, and the north of Mull, the rainfall slightly exceeded the average. Over the whole of the rest of Scotland it was under the average, the deficiency being much greater to the south than to the north of the Grampians, where at many places only from 5 to 15 per cent of the average September rainfall was collected. The extreme amounts for the month were 0.10 inch at Drumlanrig, 0.20 inch at Broomlands, 0.22 inch at Cargen, and 0.24 inch at Marchmont; but 7.02 inches at Roshven, 6.42 inches at

Glencarron, 5·14 inches at Fort-William, 4·89 inches at Craighannoch, and 4·56 inches at Kilmuir in Skye.

OCTOBER.—The mean temperature was $42^{\circ}\cdot8$, or $3^{\circ}\cdot6$ under the average, having been only twice lower during these forty years—viz., in 1880 and 1885, when it was $42^{\circ}\cdot4$. Barometric pressure was much greater at western than at eastern stations, and from this distribution of the pressure there necessarily resulted a predominance of winds from N.E., N., N.W., and W., which prevailed on twenty days, or seven days more than the average. Hence the unusually low temperature of the month. Relatively temperature was about a degree colder at eastern than at western stations. The greatest depression of temperature occurred in the upland districts of the south, from Glenlee to the Pentlands, where it equalled $5^{\circ}\cdot0$.

The mean rainfall was 4·61 inches, or 12 per cent below the average. Since the larger portion of the rain that fell was precipitated with northerly winds, it followed that the amounts were exceptionally large on the foreshores fully exposed to these winds. Thus from Speymouth to the mouth of the Dee, and in Berwickshire and parts of Roxburghshire, more than double the average rainfall of the month was collected. The amounts were also large in Caithness, Sutherland, and over the whole of the south shores of the Firths of Moray and Forth; and it further falls to be noted that the heavy rains accompanying northerly winds very seldom penetrate so far inland as they did this October. On the other hand, the rainfall was under the average over a wide area, bounded on the north by a line passing from Stornoway through Fort-Augustus to near Montrose, and on the south by a line from the south of Arran to Fife Ness. It was also under the average over a detached district, including Galloway and part of Ayrshire adjoining. Snow and sleet were of very general occurrence during the latter part of the month.

NOVEMBER.—The mean temperature was $41^{\circ}\cdot8$, or $1^{\circ}\cdot2$ above the average, the excess being equally partitioned between the days and the nights. Ayrshire and parts of the counties of Inverness, Banff, Nairn, and Sutherland showed temperatures a little under the average; but in all other parts of the country temperatures were above the average. The greatest excess was in Shetland; and to the south of the Grampians, with the exception of the county of Ayr, the excess was from $2^{\circ}\cdot0$ to $3^{\circ}\cdot0$ at a large number of stations.

The mean rainfall was 4·44 inches, or 16 per cent above the average, but its distribution was exceedingly unequal. As the heavier rains fell with east south-easterly winds, which pre-

vailed six days more than the average, the rainfall over all districts north of the Grampians was under the average, where in some places less than a fourth of the average amount was collected. It was also under the average over the whole district from the Firth of Forth to the Tweed; over the inland districts of Galloway, the west of Argyll and the Hebrides; but in none of these districts was less than two-thirds of the average collected. In other parts the average was exceeded, particularly at eastern stations from Aberdeen to Fife Ness, along the coasts of the Solway, and over high inland districts from the Cheviots to Fort-Augustus.

DECEMBER.—The mean temperature was $37^{\circ}4$, or $0^{\circ}4$ less than the average, the deficiency being wholly caused by the greater cold of the days. The greatest defect, about $1^{\circ}5$, was at south-western stations, and the smallest, only just under the average, along the coast from Banff to Berwick.

The mean rainfall was 4.38 inches, or 10 per cent above the average. It was above the average to the east of a line passing Stromness, Thurso, Fort-Augustus, Greenock, Lanark, Edinburgh, and the Isle of May, and also in the south-west of Argyll. Elsewhere it was under the average. The largest excesses above their averages were, in percentages, 90 at Keith, 74 at Haddo House, and 60 at Deerness, Gordon Castle, and Kintyre. The largest deficiency, about 40 per cent, occurred in the west of Sutherland. A heavy fall of snow occurred generally over the country on the 28th.

The harvest of 1895 was from one to two weeks later than usual in inland districts from the Clyde to the Grampians; but in other districts cutting began about the usual time, and at a number of places from a week to a fortnight earlier.

Wheat was generally about an average crop, but in many places a good deal of damage was done by the heavy rains. *Barley* was considerably above the average in a number of places, but generally the crop was only an average one, and, like the wheat crop, also suffered not a little from rain. *Oats* were a full average over large districts; elsewhere they were a fair average crop, but were a good deal damaged over the districts lying between Clydesdale and the Grampians.

Potatoes were almost everywhere a very fine crop, and singularly free from disease, except that in several scattered districts Regents were badly diseased. *Turnips* were generally a good crop; in many places in the west, however, the crop was a very variable one, owing to repeated re-sowings in spring. On the other hand, the crop was a disappointing one in Ayrshire, Galloway, Berwickshire, and parts of Perthshire and Aberdeenshire.

EDINBURGH CORN-MARKET GRAIN TABLES for WHEAT, BARLEY, OATS, and BEANS, showing the Quantity offered for Sale, the Quantity Sold, the Highest, Lowest, and Average Prices; also the Bushel weights of the Highest and Lowest Prices of each kind of Grain for every Market-day, likewise the Results for every Month, and the final Result for the year 1895.

WHEAT.

| Date | Quantity offered for Sale. | Quantity Sold. | Highest Price | Lowest Price | Average Price | Table of Bushel weight, for | | | |
|-------|----------------------------|----------------|---------------|--------------|---------------|-----------------------------|-----------------|-----------------|-----------------|
| | | | | | | Highest Price | | Lowest Price. | |
| 1895 | | | | | | 1b | 1b | 1b | 1b |
| Jan. | Imp q1. | Imp q1 | s d. | s d. | s d | | | | |
| 2 | 208 | 90 | 21 3 | 22 6 | 23 7 | | 63 | | 62 |
| 9 | 452 | 293 | 24 0 | 22 0 | 23 2 | | 63 | | 62 ¹ |
| 16 | 407 | 269 | 24 6 | 21 6 | 23 1 | | 63 | 60 ⁷ | 61 ¹ |
| 23 | 628 | 404 | 24 3 | 21 0 | 22 5 | | 64 | 60 | 62 |
| 30 | 614 | 150 | 27 0 | 20 0 | 21 9 | | 63 | | 62 |
| | 2,384 | 1,536 | 23 7 | 21 5 | 22 7 | | | | |
| Feb | | | | | | | | | |
| 6 | 374 | 265 | 22 8 | 21 0 | 21 7 | | 63 ¹ | 60 ¹ | 62 ¹ |
| 13 | 762 | 672 | 22 9 | 18 0 | 21 2 | | 63 | | 60 ¹ |
| 20 | 756 | 551 | 22 6 | 18 0 | 21 1 | | 63 | | 60 ¹ |
| 27 | 622 | 454 | 22 0 | 20 0 | 21 2 | 63 | 64 | | 60 ¹ |
| | 2,514 | 2,005 | 22 4 | 19 6 | 21 2 | | | | |
| March | | | | | | | | | |
| 6 | 853 | 711 | 21 9 | 19 0 | 20 9 | | 63 | | 62 |
| 13 | 305 | 275 | 22 6 | 18 0 | 20 6 | | 63 | | 60 |
| 20 | 219 | 97 | 22 6 | 21 6 | 22 1 | | 63 | | 62 |
| 27 | 248 | 198 | 22 6 | 21 6 | 22 2 | | 63 | | 63 ¹ |
| | 1,625 | 1,281 | 22 2 | 19 6 | 21 0 | | | | |
| April | | | | | | | | | |
| 3 | 60 | 60 | 22 6 | 18 6 | 20 3 | | 62 ¹ | | 60 ¹ |
| 10 | 56 | 56 | 22 6 | 22 0 | 22 3 | | 63 ¹ | | 63 |
| 17 | 115 | 90 | 22 9 | 22 0 | 22 5 | | 61 ¹ | | 63 |
| 24 | 53 | 53 | 23 0 | | 23 0 | | 62 ¹ | | .. |
| | 254 | 289 | 22 9 | 20 9 | 21 11 | | | | |
| May | | | | | | | | | |
| 1 | 205 | 201 | 24 9 | 23 3 | 24 2 | | 63 ¹ | | 60 |
| 8 | 972 | 727 | 25 0 | 22 0 | 23 5 | | 63 | | 61 ¹ |
| 15 | 775 | 615 | 25 0 | 21 9 | 23 11 | | 63 | | 62 |
| 22 | 625 | 456 | 26 0 | 22 6 | 23 9 | 61 | 61 ¹ | | 62 |
| 29 | 759 | 731 | 26 6 | 23 6 | 25 6 | | 61 | | 62 |
| | 3,459 | 2,522 | 25 5 | 22 9 | 24 1 | | | | |
| June | | | | | | | | | |
| 5 | 1,070 | 735 | 26 0 | 23 0 | 25 0 | | 64 ¹ | | 62 |
| 12 | 972 | 972 | 27 0 | 24 6 | 26 1 | | 65 ¹ | | 63 |
| 19 | 1,718 | 1,205 | 26 9 | 22 6 | 25 4 | | 64 | | 61 ¹ |
| 26 | 1,064 | 767 | 25 9 | 23 0 | 24 6 | | 64 | 61 ¹ | 63 |
| | 4,814 | 3,679 | 26 4 | 23 4 | 25 3 | | | | |
| July | | | | | | | | | |
| 3 | 756 | 522 | 25 6 | 23 6 | 24 6 | | 64 | | 61 ¹ |
| 10 | 516 | 135 | 25 0 | 21 0 | 23 10 | | 64 ¹ | | 61 |
| 17 | 801 | 776 | 25 0 | 23 0 | 24 4 | | 61 ¹ | | 62 |
| 24 | 1,037 | 815 | 25 0 | 23 0 | 24 3 | | 64 | | 63 |
| 31 | 1,118 | 1,019 | 25 9 | 21 0 | 24 5 | | 65 ¹ | | 60 ¹ |
| | 4,278 | 3,270 | 25 2 | 22 7 | 24 4 | | | | |

WHEAT—continued.

| Date. | Quantity offered for Sale. | Quantity Sold. | Highest Price. | Lowest Price. | Average Price. | Table of Bushel-weights for | |
|-----------------|----------------------------|----------------|----------------|---------------|----------------|-----------------------------|---------------|
| | | | | | | Highest Price. | Lowest Price. |
| 1895 | | | | | | lb. lb. | lb. lb. |
| Aug. | Imp. qr. | Imp. qr. | s. d. | s. d. | s. d. | | |
| 7 | 1,517 | 1,223 | 25 6 | 22 0 | 24 4 | 63 | 61 |
| 11 | 1,686 | 1,360 | 25 0 | 21 0 | 24 3 | 63½ 64½ | 60 |
| 21 | 1,650 | 1,237 | 25 0 | 22 0 | 23 10 | 64 | 63 |
| 28 | 822 | 408 | 25 0 | 20 0 | 23 5 | 68½ | 61½ |
| | 5,684 | 4,297 | 25 1 | 21 8 | 24 1 | | |
| Sept. | | | | | | | |
| 4 | 442 | 282 | 24 0 | 21 6 | 23 9 | 63½ 64 | 62 63 |
| 11 | 254 | .. | .. | .. | .. | .. | .. |
| 18 | 227 | 62 | 23 0 | 21 6 | 22 0 | 63 | 62½ |
| 25 | 626 | 448 | 25 0 | 20 0 | 24 0 | 64½ | 60½ |
| | 1,540 | 792 | 24 1 | 21 4 | 23 0 | | |
| Oct. | | | | | | | |
| 2 | 408 | 233 | 25 6 | 22 0 | 24 4 | 64½ | 63 |
| 9 | 430 | 325 | 26 0 | 23 6 | 24 11 | 65 | 62 |
| 16 | 323 | 245 | 26 0 | 23 0 | 25 0 | 65 | 62 |
| 23 | 529 | 356 | 30 0 | 23 6 | 26 10 | 65½ 61½ | 63 |
| 30 | 758 | 508 | 32 0 | 25 0 | 27 4 | 64 | 60½ 64 |
| | 2,448 | 1,667 | 27 11 | 24 1 | 26 0 | | |
| Nov. | | | | | | | |
| 6 | 629 | 390 | 31 0 | 21 0 | 25 11 | 68½ | 59½ |
| 13 | 447 | 176 | 30 0 | 20 0 | 25 9 | 68 | 63 |
| 20 | 263 | 63 | 30 0 | 24 0 | 27 2 | 61½ | 65½ |
| 27 | 166 | 47 | 30 0 | 22 6 | 24 8 | 63½ | 62 |
| | 1,505 | 696 | 30 2 | 21 4 | 25 11 | | |
| Dec. | | | | | | | |
| 4 | 265 | 194 | 26 0 | 23 6 | 24 5 | 63 | 62 |
| 11 | 103 | 63 | 28 0 | 27 0 | 27 11 | 63 64½ | 63 |
| 18 | 247 | 167 | 26 6 | 24 6 | 25 11 | 63 63½ | 62 |
| 24 | 20 | 20 | 25 0 | .. | 25 0 | 63 | .. |
| 31 | 54 | 47 | 28 0 | .. | 28 0 | 63 63½ | .. |
| | 689 | 491 | 27 0 | 24 0 | 25 9 | | |
| Result for year | 31,213 | 22,775 | 25 0 | 21 0 | 24 0 | | |

BARLEY.

| | | | | | | | |
|------|--------|-------|------|------|-------|-------|-----|
| 1895 | | | | | | | |
| Jan. | | | | | | | |
| 2 | 1,027 | 708 | 26 0 | 20 0 | 23 9 | 57 | 55½ |
| 9 | 2,239 | 1,426 | 28 0 | 19 0 | 23 7 | 56½ | 54 |
| 16 | 1,707 | 1,303 | 28 0 | 14 6 | 23 8 | 56½ | 51½ |
| 23 | 2,757 | 1,500 | 27 0 | 19 0 | 24 2 | 56 | 55 |
| 30 | 3,090 | 1,029 | 28 0 | 19 6 | 24 0 | 56 | 56 |
| | 10,880 | 5,966 | 27 5 | 19 1 | 23 10 | | |
| Feb. | | | | | | | |
| 6 | 2,949 | 992 | 28 0 | 18 0 | 22 4 | 56½ | 53 |
| 13 | 2,420 | 1,224 | 25 6 | 18 0 | 23 0 | 56 57 | 55½ |
| 20 | 1,944 | 1,116 | 27 0 | 19 3 | 23 11 | 57½ | 52½ |
| 27 | 1,416 | 936 | 27 0 | 15 0 | 22 9 | 57 | 51½ |
| | 8,729 | 4,268 | 26 8 | 17 8 | 22 0 | | |

BARLEY—continued.

| Date | Quantity offered for Sale. | Quantity Sold. | Highest Price. | Lowest Price. | Average Price. | Table of Bushel- weights for | |
|-------|----------------------------------|-------------------|-------------------|------------------|-------------------|---------------------------------|------------------|
| | | | | | | Highest Price. | Lowest Price. |
| 1895 | Imp. qr. | Imp. qr. | s. d. | s. d. | s. d. | lb. lb. | lb. lb. |
| March | | | | | | | |
| 6 | 1,206 | 680 | 29 6 | 18 0 | 23 8 | 58½ | 53 |
| 13 | 1,430 | 644 | 30 0 | 20 8 | 24 6 | 57 | 56 |
| 20 | 1,604 | 638 | 30 0 | 19 0 | 25 2 | 56½ | 55 |
| 27 | 1,676 | 723 | 31 0 | 22 0 | 25 3 | 57½ | 56 |
| | 5,976 | 2,694 | 30 1 | 19 11 | 24 8 | | |
| April | | | | | | | |
| 3 | 1,491 | 508 | 30 0 | 21 0 | 24 7 | 56 | 56 |
| 10 | 1,072 | 500 | 31 0 | 19 0 | 24 8 | 57½ | 50½ |
| 17 | 719 | 338 | 28 6 | 20 0 | 23 11 | 56½ | 50½ |
| 24 | 453 | 207 | 30 0 | 18 6 | 24 9 | 56 | 52½ |
| | 3,735 | 1,643 | 29 10 | 19 8 | 24 6 | | |
| May | | | | | | | |
| 1 | 471 | 296 | 26 6 | 20 0 | 25 3 | 50 56½ | 52½ |
| 8 | 613 | 244 | 26 6 | 23 0 | 24 11 | 56½ | 55 |
| 15 | 461 | 179 | 25 0 | 22 6 | 23 0 | 56 | 56 |
| 22 | 391 | 45 | 25 0 | 22 0 | 23 7 | 55½ | 56 |
| 29 | 407 | 265 | 24 6 | 20 0 | 23 1 | 56 | 51½ |
| | 2,403 | 1,020 | 25 3 | 21 11 | 24 3 | | |
| June | | | | | | | |
| 5 | 291 | 65 | 24 6 | 20 0 | 22 10 | 56 | 54 |
| 12 | 309 | 220 | 25 0 | 22 3 | 23 4 | 56 | 56 |
| 19 | 434 | 279 | 26 0 | 23 0 | 24 5 | 56 | 56 |
| 26 | 818 | 77 | 25 0 | 22 6 | 24 0 | 55 57 | 56 |
| | 1,412 | 641 | 25 3 | 22 1 | 23 10 | | |
| July | | | | | | | |
| 3 | 278 | 125 | 24 6 | 21 0 | 22 4 | 56 | 56 |
| 10 | 119 | 40 | 23 0 | .. | 23 0 | 56 | .. |
| 17 | 112 | .. | .. | .. | .. | .. | .. |
| 24 | 64 | 14 | 23 0 | .. | 23 0 | 56 | .. |
| 31 | 70 | 20 | 23 6 | .. | 23 6 | 56 | .. |
| | 643 | 190 | 23 7 | 21 0 | 22 7 | | |
| Aug. | | | | | | | |
| 7 | 124 | 89 | 23 6 | 21 3 | 22 11 | 56 | 56 |
| 14 | 201 | 230 | 25 0 | 22 0 | 23 4 | 57 | 55 56 |
| 21 | 111 | 42 | 25 0 | 21 6 | 24 5 | 57 | 56 |
| 28 | 66 | 66 | 24 0 | 22 6 | 23 8 | 56 56½ | 54 |
| | 592 | 427 | 24 4 | 21 11 | 23 5 | | |
| Sept. | | | | | | | |
| 4 | 418 | 150 | 25 0 | 23 0 | 24 3 | 56 | 56 |
| 11 | 737 | 662 | 26 0 | 20 6 | 23 0 | 55 | 55 |
| 18 | 1,261 | 885 | 25 0 | 20 6 | 22 8 | 56 | 56 |
| 25 | 1,573 | 1,401 | 25 9 | 20 0 | 23 2 | 56 | 54½ |
| | 3,989 | 3,098 | 25 6 | 20 10 | 23 2 | | |
| Oct. | | | | | | | |
| 2 | 1,270 | 1,024 | 25 6 | 20 6 | 23 3 | 56 | 54 |
| 9 | 1,340 | 962 | 25 0 | 19 6 | 22 8 | 56 | 55 |
| 16 | 1,151 | 995 | 24 6 | 15 0 | 23 1 | 56 57½ | 48 |
| 23 | 1,806 | 1,094 | 25 0 | 20 0 | 22 9 | 55½ 56 | 56 |
| 30 | 2,213 | 1,380 | 26 0 | 19 0 | 23 7 | 56½ | 53 |
| | 7,791 | 5,464 | 25 0 | 19 5 | 23 1 | | |

BARLEY—continued.

| Date. | Quantity offered for Sale | Quantity Sold | Highest Price. | Lowest Price. | Average Price. | Table of Bushel- weights for | | | |
|-----------------------|---------------------------------|------------------|-------------------|------------------|-------------------|---------------------------------|-----|------------------|-----|
| | | | | | | Highest Price. | | Lowest Price. | |
| 1895 | Imp. qr. | Imp. qr. | s. d. | s. d. | s. d. | lb. | lb. | lb. | lb. |
| Nov. | | | | | | | | | |
| 6 | 2,535 | 1,880 | 26 6 | 20 0 | 23 5 | 57½ | | 55 | |
| 13 | 1,909 | 1,356 | 26 0 | 20 6 | 23 8 | 56 | | 52½ | |
| 20 | 2,266 | 1,352 | 26 6 | 18 6 | 22 11 | 56 57½ | | 52 | |
| 27 | 2,690 | 1,238 | 25 6 | 19 6 | 22 5 | 56½ | | 54 | |
| | 9,400 | 5,826 | 26 1 | 19 8 | 23 2 | | | | |
| Dec. | | | | | | | | | |
| 4 | 2,143 | 1,310 | 25 0 | 20 0 | 22 1 | 55½ | | 53½ | 54½ |
| 11 | 1,008 | 1,265 | 24 6 | 18 9 | 21 8 | 56 | | 51½ | |
| 18 | 2,118 | 1,168 | 25 0 | 19 6 | 21 11 | 56½ | | 56 | |
| 24 | 844 | 808 | 24 6 | 20 0 | 22 5 | 56½ | 56½ | 53½ | 55 |
| 31 | 1,219 | 845 | 26 0 | 20 0 | 23 3 | 56½ | | 55½ | |
| | 8,532 | 4,056 | 24 11 | 19 8 | 22 2 | | | | |
| Result for year | 64,082 | 36,211 | 25 7 | 20 1 | 23 4 | | | | |

OATS.

| | | | | | | | |
|-------|--------|--------|-------|------|-------|-----|-----|
| 1895 | | | | | | | |
| Jan. | | | | | | | |
| 2 | 1,873 | 1,031 | 21 6 | 13 0 | 19 2 | 44½ | 40½ |
| 9 | 3,209 | 2,442 | 22 0 | 14 0 | 19 4 | 45½ | 41 |
| 16 | 3,686 | 2,621 | 23 0 | 15 9 | 19 7 | 45½ | 41 |
| 23 | 4,490 | 2,412 | 22 9 | 15 8 | 19 3 | 45½ | 40 |
| 30 | 4,172 | 1,946 | 22 6 | 15 6 | 19 4 | 46 | 42 |
| | 17,829 | 10,155 | 21 11 | 15 2 | 19 4 | | |
| Feb. | | | | | | | |
| 6 | 4,014 | 1,973 | 22 3 | 13 0 | 19 0 | 45 | 42 |
| 13 | 4,200 | 2,122 | 21 9 | 13 0 | 18 8 | 44½ | 42 |
| 20 | 3,960 | 2,008 | 22 0 | 15 6 | 19 2 | 45½ | 40 |
| 27 | 4,535 | 2,560 | 22 6 | 13 6 | 19 7 | 45 | 42 |
| | 17,359 | 8,648 | 22 1 | 14 0 | 19 2 | | |
| March | | | | | | | |
| 6 | 5,711 | 2,144 | 23 0 | 15 0 | 19 10 | 45 | 40½ |
| 13 | 5,541 | 2,797 | 24 0 | 16 0 | 20 3 | 45½ | 41 |
| 20 | 4,954 | 1,916 | 24 0 | 14 6 | 20 2 | 45½ | 42 |
| 27 | 4,516 | 2,157 | 25 0 | 15 6 | 20 6 | 45 | 40 |
| | 21,025 | 9,014 | 23 11 | 15 7 | 20 2 | | |
| April | | | | | | | |
| 3 | 5,069 | 1,823 | 25 0 | 15 9 | 20 6 | 42 | 40½ |
| 10 | 3,785 | 1,243 | 23 0 | 16 9 | 20 2 | 45 | 42 |
| 17 | 3,999 | 1,704 | 24 3 | 14 6 | 19 10 | 46½ | 41 |
| 24 | 2,696 | 1,717 | 23 6 | 16 6 | 20 4 | 41½ | 39½ |
| | 15,539 | 6,487 | 23 7 | 16 3 | 20 3 | | |
| May | | | | | | | |
| 1 | 2,873 | 1,654 | 23 9 | 16 6 | 20 11 | 46½ | 40 |
| 8 | 2,862 | 1,303 | 24 0 | 16 0 | 20 10 | 45½ | 43½ |
| 15 | 2,846 | 1,445 | 23 6 | 17 6 | 21 1 | 45 | 42½ |
| 22 | 2,539 | 793 | 23 6 | 17 8 | 21 3 | 46 | 40 |
| 29 | 1,816 | 1,191 | 23 6 | 19 3 | 21 7 | 45½ | 42 |
| | 12,436 | 6,386 | 23 8 | 17 7 | 21 1 | | |

OATS—continued.

| Date. | Quantity offered for Sale. | Quantity Sold. | Highest Price. | Lowest Price. | Average Price. | Table of Bushel- weights for | |
|-----------------------|----------------------------------|-------------------|-------------------|------------------|-------------------|---------------------------------|------------------|
| | | | | | | Highest Price. | Lowest Price. |
| 1895 | Imp. qr. | Imp. qr. | s. d. | s. d. | s. d. | lb. lb. | lb. lb. |
| June | | | | | | | |
| 5 | 1,951 | 1,193 | 23 9 | 18 0 | 21 0 | 45½ | 41 |
| 12 | 2,200 | 1,089 | 24 0 | 18 3 | 21 4 | 46 | 43 |
| 19 | 3,007 | 1,009 | 23 6 | 19 6 | 21 8 | 45½ 46½ | 43½ |
| 26 | 2,507 | 811 | 23 6 | 18 0 | 21 1 | 45½ 46½ | 41 |
| | 9,665 | 4,102 | 23 8 | 18 4 | 21 3 | | |
| July | | | | | | | |
| 3 | 2,724 | 736 | 23 0 | 19 0 | 21 0 | 45 | 42 |
| 10 | 1,937 | 662 | 23 0 | 18 9 | 20 5 | 45½ | 42 |
| 17 | 2,034 | 1,254 | 23 3 | 18 3 | 20 9 | 46½ | 41½ |
| 24 | 1,565 | 1,085 | 22 9 | 17 0 | 21 1 | 45½ | 41 |
| 31 | 2,075 | 1,299 | 23 6 | 19 0 | 21 8 | 44 | 42 |
| | 10,335 | 5,036 | 23 0 | 18 6 | 21 1 | | |
| Aug. | | | | | | | |
| 7 | 1,772 | 876 | 23 6 | 16 6 | 21 9 | 45½ 46 | 41 |
| 14 | 2,718 | 1,361 | 23 0 | 17 6 | 21 2 | 45½ 46 | 42 |
| 21 | 2,164 | 907 | 22 6 | 19 0 | 20 8 | 45½ | 42 |
| 28 | 1,971 | 612 | 22 6 | 17 9 | 20 2 | 44½ 45 | 42 |
| | 8,625 | 3,756 | 23 1 | 18 1 | 21 0 | | |
| Sept. | | | | | | | |
| 4 | 2,399 | 1,304 | 23 6 | 17 0 | 19 11 | 41½ | 41 |
| 11 | 3,026 | 1,740 | 22 9 | 17 0 | 19 4 | 45 | 43½ |
| 18 | 2,271 | 1,285 | 21 6 | 16 6 | 18 3 | 44½ 45½ | 42½ |
| 25 | 2,255 | 1,632 | 21 6 | 16 0 | 18 7 | 46 | 42 |
| | 9,951 | 5,961 | 21 1 | 16 8 | 19 0 | | |
| Oct. | | | | | | | |
| 2 | 2,069 | 1,401 | 22 0 | 16 0 | 18 3 | 45 | 42 |
| 9 | 2,578 | 1,345 | 22 0 | 14 9 | 18 6 | 45 | 39 |
| 16 | 2,513 | 1,805 | 22 0 | 15 3 | 18 9 | 41½ | 40 |
| 23 | 2,484 | 1,545 | 23 0 | 16 0 | 19 0 | 45½ | 40 |
| 30 | 2,463 | 1,786 | 23 0 | 15 0 | 19 2 | 44 | 41 |
| | 12,007 | 7,882 | 22 5 | 15 7 | 18 9 | | |
| Nov. | | | | | | | |
| 6 | 2,887 | 1,685 | 21 6 | 16 0 | 15 11 | 41½ 45 | 42 |
| 13 | 2,974 | 1,588 | 21 9 | 16 6 | 19 0 | 44½ | 42 |
| 20 | 3,317 | 1,310 | 20 6 | 14 0 | 18 5 | 45 | 36½ 38 |
| 27 | 3,010 | 1,237 | 23 0 | 14 6 | 18 0 | 44½ | 39½ |
| | 12,188 | 5,827 | 21 3 | 15 6 | 18 8 | | |
| Dec. | | | | | | | |
| 4 | 2,536 | 933 | 22 0 | 11 0 | 17 10 | 41½ | 39 |
| 11 | 3,087 | 1,560 | 20 6 | 15 0 | 17 8 | 41½ | 40 41 |
| 18 | 2,770 | 1,116 | 20 0 | 14 3 | 17 9 | 11½ 45½ | 41 |
| 24 | 1,187 | 798 | 20 0 | 15 6 | 17 4 | 15 | 41 42 |
| 31 | 1,698 | 1,128 | 20 3 | 15 3 | 17 4 | 14½ | 40 |
| | 11,278 | 5,541 | 20 3 | 15 1 | 17 7 | | |
| Result for year | 138,827 | 79,095 | 22 6 | 16 1 | 19 8 | | |

BEANS.

| Date. | Quantity offered for Sale. | Quantity Sold. | Highest Price. | Lowest Price. | Average Price. | Table of Bushel- weights for - | |
|--------------|----------------------------------|-------------------|-------------------|------------------|-------------------|-----------------------------------|------------------|
| | | | | | | Highest Price. | Lowest Price. |
| 1895 Jan. | Imp qr. | Imp qr. | s. d. | s. d. | s. d. | lb. lb. | lb. lb. |
| 2 | 35 | 20 | 27 6 | .. | 27 6 | 68 | .. |
| 9 | 41 | 31 | 29 0 | 28 6 | 28 11 | 64 65 | 63 |
| 16 | 58 | .. | .. | .. | .. | .. | .. |
| 23 | 208 | 135 | 28 6 | 22 3 | 24 7 | 64 | 60½ |
| 30 | 99 | 46 | 27 6 | 26 0 | 26 6 | 64 | 61½ |
| | 441 | 232 | 28 3 | 23 4 | 25 10 | | |
| Feb. | | | | | | | |
| 6 | 215 | 55 | 27 6 | 21 6 | 25 5 | 64 | 60½ |
| 13 | 373 | 195 | 27 0 | 22 0 | 25 3 | 64 | 60 |
| 20 | 439 | 132 | 27 6 | 23 0 | 25 5 | 65 | 60½ |
| 27 | 424 | 210 | 27 9 | 23 6 | 25 4 | 65½ | 61½ |
| | 1,451 | 601 | 27 6 | 22 4 | 25 4 | | |
| March | | | | | | | |
| 6 | 364 | 196 | 30 0 | 24 0 | 25 6 | 65 | 63 |
| 13 | 109 | 58 | 36 0 | 22 0 | 26 11 | 63 | 58½ |
| 20 | 133 | 86 | 29 0 | 26 0 | 26 4 | 64½ | 63½ |
| 27 | 101 | 29 | 30 0 | 27 0 | 27 11 | 65½ | 63 64½ |
| | 707 | 369 | 29 10 | 24 9 | 26 1 | | |
| April | | | | | | | |
| 3 | 65 | 23 | 30 0 | .. | 30 0 | 65½ | .. |
| 10 | 75 | 15 | 28 0 | .. | 28 0 | 65 | .. |
| 17 | 30 | 5 | 28 6 | .. | 28 6 | 65½ | .. |
| 24 | 36 | 28 | 29 0 | 27 0 | 27 9 | 65½ | 63 |
| | 206 | 71 | 29 1 | 27 0 | 28 7 | | |
| May | | | | | | | |
| 1 | 45 | 28 | 28 0 | 22 6 | 26 0 | 62 63 | 57½ |
| 8 | 17 | .. | .. | .. | .. | .. | .. |
| 15 | 74 | 40 | 30 0 | 29 6 | 29 9 | 63½ | 63½ |
| 22 | 70 | 17 | 29 0 | 28 6 | 28 8 | 64 | 64 |
| 29 | 36 | 36 | 31 0 | .. | 31 0 | 65 | .. |
| | 248 | 121 | 29 11 | 27 7 | 29 1 | | |
| June | | | | | | | |
| 5 | 34 | 10 | 28 6 | .. | 28 6 | 62 | .. |
| 12 | 32 | 12 | 29 6 | .. | 29 6 | 62 | .. |
| 19 | 14 | .. | .. | .. | .. | .. | .. |
| 26 | 37 | .. | .. | .. | .. | .. | .. |
| | 117 | 22 | 29 1 | .. | 29 1 | | |
| July | | | | | | | |
| 3 | 4 | .. | .. | .. | .. | .. | .. |
| 10 | .. | .. | .. | .. | .. | .. | .. |
| 17 | .. | .. | .. | .. | .. | .. | .. |
| 24 | 14 | 14 | 31 6 | .. | 31 6 | 63 | .. |
| 31 | 25 | 25 | 29 0 | .. | 29 0 | 65½ | .. |
| | 43 | 30 | 29 11 | .. | 29 11 | | |
| Aug. | | | | | | | |
| 7 | 19 | .. | .. | .. | .. | .. | .. |
| 14 | .. | .. | .. | .. | .. | .. | .. |
| 21 | 21 | .. | .. | .. | .. | .. | .. |
| 28 | 20 | .. | .. | .. | .. | .. | .. |
| | 60 | .. | .. | .. | .. | | |

BEANS—continued.

| Date. | Quantity offered for Sale. | Quantity Sold. | Highest Price. | Lowest Price. | Average Price. | Table of Bushel- weights for | |
|-----------------------|----------------------------------|-------------------|-------------------|------------------|-------------------|---------------------------------|------------------|
| | | | | | | Highest Price. | Lowest Price. |
| 1895 | Imp. qr. | Imp. qr. | s. d. | s. d. | s. d. | lb. lb. | lb. lb. |
| Sept. | 21 | .. | .. | .. | .. | .. | .. |
| 4 | .. | .. | .. | .. | .. | .. | .. |
| 11 | .. | .. | .. | .. | .. | .. | .. |
| 18 | .. | .. | .. | .. | .. | .. | .. |
| 25 | .. | .. | .. | .. | .. | .. | .. |
| | 21 | .. | .. | .. | .. | | |
| Oct. | 28 | 28 | 31 6 | 28 6 | 29 11 | 63½ | 63 |
| 2 | 50 | 20 | 28 0 | .. | 28 0 | 63 | .. |
| 9 | 69 | 5 | 32 6 | .. | 32 6 | 63 | .. |
| 16 | .. | .. | .. | .. | .. | .. | .. |
| 23 | 46 | .. | .. | .. | .. | .. | .. |
| 30 | 193 | 53 | 29 9 | 28 6 | 29 5 | | |
| Nov | 25 | .. | .. | .. | .. | .. | .. |
| 6 | 50 | .. | .. | .. | .. | .. | .. |
| 13 | 23 | 7 | 30 0 | .. | 30 0 | 65½ | .. |
| 20 | 42 | 10 | 29 0 | .. | 29 0 | 64½ | .. |
| 27 | 110 | 17 | 29 5 | .. | 29 5 | | |
| Dec. | 32 | .. | .. | .. | .. | .. | .. |
| 4 | 32 | .. | .. | .. | .. | .. | .. |
| 11 | 72 | .. | .. | .. | .. | .. | .. |
| 18 | 44 | 10 | 28 0 | .. | 28 0 | 63 | .. |
| 24 | 37 | 37 | 32 0 | 29 3 | 29 11 | 65½ | 62½ |
| 31 | 217 | 47 | 29 11 | 29 3 | 29 6 | | |
| Result for year | 3,844 | 1,572 | 29 2 | 25 1 | 26 6 | | |

PRICES OF SHEEP SINCE 1818. TABLE No. 1.—CHEVIOT SHEEP.

| Year. | Wethers. | | Ewes. | | Lambs. | |
|-------|----------|----|-------|----|--------|----|
| | s. | d. | s. | d. | s. | d. |
| 1818 | 28 | 0 | to | 30 | 8 | 0 |
| 1819 | 25 | 0 | " | 27 | 10 | 6 |
| 1820 | 20 | 0 | " | 25 | 10 | 0 |
| 1821 | 15 | 0 | " | 20 | 7 | 6 |
| 1822 | 12 | 6 | " | 13 | 4 | 6 |
| 1823 | 13 | 6 | " | 18 | 5 | 6 |
| 1824 | 14 | 0 | " | 19 | 4 | 6 |
| 1825 | 29 | 0 | " | 32 | 9 | 0 |
| 1826 | 17 | 6 | " | 21 | 7 | 0 |
| 1827 | 15 | 0 | " | 24 | 7 | 0 |
| 1828 | 18 | 0 | " | 27 | 7 | 0 |
| 1829 | 18 | 0 | " | 24 | 7 | 0 |
| 1830 | 15 | 0 | " | 21 | 6 | 9 |
| 1831 | 18 | 0 | " | 25 | 7 | 0 |
| 1832 | 19 | 0 | " | 24 | 7 | 0 |
| 1833 | 22 | 0 | " | 31 | 8 | 0 |
| 1834 | 22 | 0 | " | 31 | 9 | 0 |
| 1835 | 22 | 0 | " | 27 | 8 | 0 |
| 1836 | 24 | 0 | " | 31 | 10 | 0 |
| 1837 | 19 | 0 | " | 28 | 10 | 0 |
| 1838 | 23 | 0 | " | 30 | 12 | 0 |
| 1839 | 23 | 0 | " | 31 | 0 | 0 |
| 1840 | 24 | 0 | " | 33 | 7 | 0 |
| 1841 | 23 | 0 | " | 30 | 8 | 0 |
| 1842 | 22 | 6 | " | 28 | 7 | 6 |
| 1843 | 19 | 0 | " | 25 | 5 | 0 |
| 1844 | 21 | 0 | " | 29 | 8 | 0 |
| 1845 | 23 | 0 | " | 33 | 8 | 0 |
| 1846 | 24 | 0 | " | 33 | 10 | 0 |
| 1847 | 24 | 0 | " | 35 | 11 | 6 |
| 1848 | 23 | 0 | " | 34 | 11 | 6 |
| 1849 | 21 | 0 | " | 30 | 0 | 0 |
| 1850 | 20 | 6 | " | 29 | 8 | 0 |
| 1851 | 21 | 6 | " | 31 | 8 | 9 |
| 1852 | 21 | 0 | " | 32 | 8 | 0 |
| 1853 | 20 | 6 | " | 38 | 9 | 0 |
| 1854 | 25 | 0 | " | 36 | 9 | 0 |
| 1855 | 23 | 6 | " | 36 | 10 | 0 |
| 1856 | 22 | 0 | " | 35 | 10 | 0 |
| 1857 | 24 | 0 | " | 36 | 10 | 6 |
| 1858 | 24 | 0 | " | 34 | 10 | 6 |
| 1859 | 25 | 0 | " | 34 | 10 | 3 |
| 1860 | 26 | 0 | " | 38 | 12 | 6 |
| 1861 | 25 | 0 | " | 38 | 9 | 0 |
| 1862 | 27 | 0 | " | 37 | 10 | 0 |
| 1863 | 25 | 0 | " | 38 | 10 | 6 |
| 1864 | 31 | 0 | " | 41 | 14 | 0 |
| 1865 | 32 | 6 | " | 44 | 14 | 6 |
| 1866 | 37 | 0 | " | 50 | 15 | 0 |
| 1867 | 26 | 0 | " | 58 | 12 | 0 |
| 1868 | 30 | 0 | " | 32 | 7 | 6 |
| 1869 | 28 | 0 | " | 33 | 7 | 6 |
| 1870 | 25 | 6 | " | 42 | 10 | 0 |
| 1871 | 26 | 6 | " | 40 | 14 | 0 |
| 1872 | 45 | 0 | " | 56 | 16 | 0 |
| 1873 | 42 | 0 | " | 51 | 15 | 6 |
| 1874 | 33 | 6 | " | 44 | 12 | 0 |
| 1875 | 33 | 0 | " | 48 | 13 | 6 |
| 1876 | 40 | 0 | " | 52 | 13 | 6 |
| 1877 | 41 | 0 | " | 51 | 15 | 0 |
| 1878 | 35 | 6 | " | 48 | 14 | 0 |
| 1879 | 34 | 0 | " | 44 | 14 | 0 |
| 1880 | 30 | 0 | " | 43 | 12 | 6 |
| 1881 | 32 | 0 | " | 45 | 14 | 0 |
| 1882 | 40 | 0 | " | 51 | 14 | 0 |
| 1883 | 44 | 0 | " | 55 | 15 | 6 |
| 1884 | 36 | 0 | " | 47 | 12 | 6 |
| 1885 | 30 | 0 | " | 38 | 12 | 0 |
| 1886 | 32 | 0 | " | 40 | 12 | 6 |
| 1887 | 29 | 0 | " | 36 | 11 | 0 |
| 1888 | 30 | 0 | " | 38 | 12 | 0 |
| 1889 | 36 | 0 | " | 44 | 14 | 0 |
| 1890 | 31 | 0 | " | 40 | 12 | 6 |
| 1891 | 27 | 0 | " | 38 | 9 | 0 |
| 1892 | 22 | 0 | " | 30 | 5 | 0 |
| 1893 | 26 | 0 | " | 35 | 8 | 6 |
| 1894 | 26 | 0 | " | 37 | 10 | 6 |
| 1895 | 28 | 0 | " | 39 | 11 | 6 |

TABLE No. 2.—BLACKFACED SHEEP.

| Year. | Wethers. | | | | Ewes. | | | | Lambs. | | | | | | |
|-------|-------------|----|----|----|-------|-------------|----|----|--------|----|-------------|----|----|----|----|
| | s. | d. | to | s. | d. | s. | d. | to | s. | d. | s. | d. | to | s. | d. |
| 1819 | 22 | 0 | to | 24 | 0 | 12 | 0 | to | 15 | 0 | 8 | 0 | to | 9 | 0 |
| 1820 | 20 | 0 | " | 23 | 8 | 15 | 6 | " | 17 | 0 | 7 | 0 | " | 8 | 6 |
| 1821 | 18 | 0 | " | 20 | 0 | 12 | 0 | " | 18 | 0 | 6 | 0 | " | 7 | 0 |
| 1822 | 11 | 6 | " | 13 | 6 | 5 | 6 | " | 6 | 0 | 4 | 6 | " | 0 | 0 |
| 1823 | 12 | 0 | " | 16 | 0 | 5 | 0 | " | 6 | 6 | 4 | 0 | " | 5 | 3 |
| 1824 | 9 | 6 | " | 13 | 6 | 6 | 0 | " | 7 | 0 | 4 | 0 | " | 5 | 0 |
| 1825 | 22 | 0 | " | 26 | 0 | 11 | 0 | " | 13 | 6 | 6 | 0 | " | 9 | 0 |
| 1826 | 15 | 0 | " | 17 | 0 | 8 | 0 | " | 9 | 0 | 4 | 6 | " | 6 | 0 |
| 1827 | 14 | 0 | " | 18 | 6 | 7 | 0 | " | 10 | 0 | 6 | 0 | " | 7 | 6 |
| 1828 | 13 | 0 | " | 20 | 0 | 8 | 0 | " | 11 | 0 | 5 | 0 | " | 7 | 6 |
| 1829 | 14 | 0 | " | 18 | 0 | 9 | 0 | " | 10 | 0 | 6 | 0 | " | 7 | 0 |
| 1830 | 9 | 6 | " | 13 | 0 | 4 | 0 | " | 6 | 0 | 4 | 6 | " | 6 | 0 |
| 1831 | 13 | 0 | " | 17 | 0 | 5 | 0 | " | 7 | 6 | 5 | 0 | " | 6 | 6 |
| 1832 | 14 | 0 | " | 18 | 0 | 7 | 0 | " | 11 | 6 | 6 | 0 | " | 7 | 8 |
| 1833 | 16 | 0 | " | 24 | 0 | 7 | 6 | " | 12 | 0 | 6 | 6 | " | 9 | 0 |
| 1834 | 16 | 0 | " | 22 | 0 | 10 | 0 | " | 13 | 0 | 6 | 0 | " | 8 | 6 |
| 1835 | 15 | 0 | " | 18 | 0 | 10 | 0 | " | 13 | 0 | 7 | 0 | " | 8 | 0 |
| 1836 | 15 | 0 | " | 21 | 0 | 9 | 0 | " | 12 | 0 | 8 | 6 | " | 11 | 0 |
| 1837 | 13 | 0 | " | 16 | 0 | 8 | 0 | " | 12 | 0 | 8 | 0 | " | 9 | 6 |
| 1838 | 15 | 0 | " | 20 | 6 | 10 | 0 | " | 13 | 0 | not quoted. | | | | |
| 1839 | 15 | 0 | " | 22 | 0 | 10 | 0 | " | 12 | 0 | 7 | 0 | to | 8 | 3 |
| 1840 | 15 | 0 | " | 22 | 6 | 11 | 0 | " | 12 | 0 | 7 | 0 | " | 9 | 3 |
| 1841 | 16 | 0 | " | 20 | 0 | 9 | 0 | " | 11 | 0 | 6 | 0 | " | 5 | 0 |
| 1842 | 14 | 0 | " | 19 | 0 | 7 | 6 | " | 8 | 0 | 5 | 6 | " | 7 | 0 |
| 1843 | not quoted. | | | | | 4 | 9 | " | 6 | 6 | not quoted. | | | | |
| 1844 | 15 | 0 | to | 21 | 0 | 6 | 6 | " | 10 | 0 | 5 | 0 | to | 8 | 0 |
| 1845 | 14 | 0 | " | 23 | 0 | 8 | 0 | " | 12 | 0 | 6 | 0 | " | 8 | 0 |
| 1846 | 13 | 0 | " | 24 | 0 | 10 | 0 | " | 13 | 0 | 8 | 0 | " | 9 | 0 |
| 1847 | 20 | 6 | " | 25 | 0 | 10 | 0 | " | 14 | 0 | 8 | 6 | " | 9 | 6 |
| 1848 | 20 | 0 | " | 24 | 0 | 11 | 3 | " | 12 | 0 | 8 | 6 | " | 10 | 0 |
| 1849 | not quoted. | | | | | not quoted. | | | | | 7 | 0 | " | 7 | 6 |
| 1850 | | | | | | | | | | | 7 | 0 | " | 0 | 0 |
| 1851 | 17 | 6 | to | 23 | 0 | 9 | 0 | to | 12 | 0 | 6 | 6 | " | 8 | 0 |
| 1852 | 18 | 6 | " | 22 | 0 | 9 | 6 | " | 12 | 0 | 4 | 6 | " | 7 | 9 |
| 1853 | 23 | 0 | " | 27 | 0 | 14 | 6 | " | 16 | 6 | 8 | 0 | " | 11 | 6 |
| 1854 | 20 | 0 | " | 26 | 0 | 11 | 0 | " | 16 | 6 | 8 | 0 | " | 10 | 6 |
| 1855 | 21 | 6 | " | 26 | 6 | 14 | 0 | " | 16 | 0 | 10 | 0 | " | 11 | 0 |
| 1856 | 17 | 0 | " | 24 | 0 | 10 | 0 | " | 20 | 0 | 7 | 6 | " | 10 | 0 |
| 1857 | 20 | 0 | " | 29 | 0 | 10 | 6 | " | 15 | 0 | 9 | 3 | " | 11 | 0 |
| 1858 | 20 | 0 | " | 27 | 6 | 9 | 9 | " | 18 | 9 | 8 | 3 | " | 10 | 6 |
| 1859 | 20 | 0 | " | 25 | 0 | 10 | 0 | " | 14 | 0 | 8 | 9 | " | 11 | 0 |
| 1860 | 21 | 0 | " | 27 | 3 | 11 | 0 | " | 16 | 0 | 10 | 0 | " | 13 | 6 |
| 1861 | 21 | 0 | " | 29 | 0 | 12 | 0 | " | 22 | 0 | 6 | 3 | " | 14 | 0 |
| 1862 | 16 | 9 | " | 27 | 0 | 12 | 0 | " | 18 | 8 | 6 | 0 | " | 12 | 0 |
| 1863 | 20 | 0 | " | 30 | 6 | 13 | 0 | " | 16 | 0 | 8 | 0 | " | 11 | 6 |
| 1864 | 25 | 0 | " | 30 | 0 | 15 | 0 | " | 19 | 0 | 10 | 0 | " | 13 | 6 |
| 1865 | 15 | 6 | " | 32 | 6 | 15 | 0 | " | 25 | 0 | 10 | 0 | " | 17 | 0 |
| 1866 | 31 | 6 | " | 40 | 0 | 20 | 0 | " | 36 | 0 | 13 | 6 | " | 22 | 6 |
| 1867 | 20 | 0 | " | 30 | 6 | 14 | 0 | " | 22 | 0 | 7 | 6 | " | 13 | 6 |
| 1868 | 20 | 0 | " | 26 | 0 | 10 | 6 | " | 13 | 6 | 7 | 0 | " | 18 | 0 |
| 1869 | 22 | 0 | " | 28 | 0 | 11 | 0 | " | 14 | 0 | 6 | 9 | " | 9 | 0 |
| 1870 | 27 | 0 | " | 32 | 6 | 13 | 0 | " | 22 | 0 | 8 | 0 | " | 14 | 6 |
| 1871 | 23 | 0 | " | 37 | 0 | 13 | 0 | " | 23 | 0 | 11 | 0 | " | 16 | 3 |
| 1872 | 31 | 6 | " | 45 | 0 | 18 | 0 | " | 32 | 0 | 12 | 6 | " | 18 | 0 |
| 1873 | 28 | 0 | " | 39 | 0 | 16 | 6 | " | 27 | 0 | 7 | 0 | " | 16 | 0 |
| 1874 | 25 | 0 | " | 35 | 0 | 13 | 0 | " | 20 | 0 | 7 | 0 | " | 14 | 0 |
| 1875 | 26 | 6 | " | 37 | 6 | 15 | 0 | " | 31 | 3 | 9 | 6 | " | 17 | 6 |
| 1876 | 30 | 0 | " | 40 | 0 | 19 | 0 | " | 24 | 0 | 13 | 0 | " | 20 | 6 |
| 1877 | 35 | 0 | " | 38 | 9 | 18 | 0 | " | 25 | 0 | 13 | 6 | " | 23 | 0 |
| 1878 | 30 | 0 | " | 36 | 0 | 17 | 0 | " | 23 | 0 | 12 | 0 | " | 22 | 0 |
| 1879 | 25 | 0 | " | 35 | 9 | 16 | 0 | " | 24 | 0 | 10 | 6 | " | 20 | 0 |
| 1880 | 25 | 0 | " | 38 | 0 | 16 | 6 | " | 22 | 6 | 10 | 0 | " | 17 | 0 |
| 1881 | 30 | 0 | " | 39 | 0 | 15 | 0 | " | 23 | 0 | 10 | 0 | " | 15 | 0 |
| 1882 | 33 | 0 | " | 46 | 0 | 20 | 0 | " | 28 | 0 | 12 | 6 | " | 18 | 6 |
| 1883 | 36 | 0 | " | 50 | 6 | 24 | 6 | " | 33 | 0 | 14 | 0 | " | 21 | 6 |
| 1884 | 29 | 0 | " | 43 | 6 | 19 | 6 | " | 28 | 0 | 12 | 0 | " | 19 | 6 |
| 1885 | 24 | 0 | " | 34 | 0 | 18 | 0 | " | 22 | 6 | 10 | 0 | " | 15 | 0 |
| 1886 | 25 | 0 | " | 34 | 0 | 12 | 0 | " | 22 | 0 | 10 | 6 | " | 16 | 0 |
| 1887 | 22 | 0 | " | 30 | 0 | 11 | 0 | " | 19 | 0 | 8 | 0 | " | 13 | 0 |
| 1888 | 22 | 0 | " | 32 | 0 | 13 | 0 | " | 24 | 0 | 10 | 0 | " | 15 | 0 |
| 1889 | 26 | 0 | " | 40 | 0 | 18 | 0 | " | 29 | 0 | 13 | 0 | " | 22 | 0 |
| 1890 | 24 | 0 | " | 37 | 0 | 14 | 0 | " | 27 | 0 | 10 | 6 | " | 19 | 0 |
| 1891 | 21 | 0 | " | 37 | 0 | 10 | 0 | " | 24 | 0 | 7 | 6 | " | 15 | 0 |
| 1892 | 16 | 0 | " | 28 | 6 | 6 | 0 | " | 17 | 0 | 3 | 0 | " | 10 | 0 |
| 1893 | 21 | 0 | " | 37 | 0 | 12 | 0 | " | 24 | 0 | 7 | 0 | " | 14 | 6 |
| 1894 | 20 | 0 | " | 37 | 6 | 14 | 6 | " | 26 | 6 | 8 | 6 | " | 16 | 0 |
| 1895 | 23 | 0 | " | 41 | 0 | 16 | 0 | " | 28 | 6 | 9 | 0 | " | 17 | 0 |

TABLE No. 3.—PRICE OF WOOL, PER STONE OF 24 LB., SINCE 1818.

| Year. | Laid Cheviot. | | White Cheviot. | | Laid Highland | | White Highland. | | | | | | |
|-------|---------------|----|----------------|----|---------------|------------------------------------|-----------------|-------------|----|----|----|----|----|
| | s. | d. | s. | d. | s. | d. | s. | d. | | | | | |
| 1818 | 40 | 0 | to | 42 | 2 | 20 | 0 | to | 22 | 0 | .. | | |
| 1819 | 21 | 0 | " | 22 | 0 | 10 | 0 | " | 10 | 3 | .. | | |
| 1820 | 20 | 0 | " | 22 | 0 | 9 | 0 | " | 10 | 0 | .. | | |
| 1821 | 18 | 0 | " | 20 | 0 | 9 | 0 | " | 10 | 0 | .. | | |
| 1822 | 12 | 6 | " | 14 | 6 | 5 | 0 | " | 6 | 6 | .. | | |
| 1823 | 9 | 0 | " | 10 | 6 | 5 | 0 | " | 5 | 9 | .. | | |
| 1824 | 18 | 6 | " | 15 | 0 | 6 | 0 | " | 6 | 3 | .. | | |
| 1825 | 10 | 6 | " | 22 | 0 | 10 | 0 | " | 10 | 6 | .. | | |
| 1826 | 11 | 0 | " | 14 | 0 | 5 | 0 | " | 5 | 6 | .. | | |
| 1827 | 11 | 0 | " | 14 | 0 | 5 | 6 | " | 6 | 9 | .. | | |
| 1828 | 8 | 0 | " | 11 | 0 | 5 | 6 | " | 6 | 0 | .. | | |
| 1829 | 8 | 6 | " | 11 | 0 | 4 | 3 | " | 0 | 0 | .. | | |
| 1830 | 9 | 6 | " | 11 | 0 | 4 | 6 | " | 5 | 0 | .. | | |
| 1831 | 17 | 0 | " | 20 | 0 | 7 | 6 | " | 8 | 6 | .. | | |
| 1832 | 14 | 0 | " | 16 | 0 | 7 | 0 | " | 7 | 6 | .. | | |
| 1833 | 18 | 0 | " | 20 | 7 | 10 | 0 | " | 11 | 0 | .. | | |
| 1834 | 21 | 0 | " | 24 | 6 | 5 | 6 | " | 7 | 0 | .. | | |
| 1835 | 19 | 0 | " | 20 | 6 | 9 | 6 | " | 10 | 8 | .. | | |
| 1836 | 21 | 0 | " | 25 | 0 | 10 | 0 | " | 14 | 0 | .. | | |
| 1837 | 12 | 0 | " | 14 | 0 | 7 | 0 | " | 7 | 8 | .. | | |
| 1838 | 19 | 0 | " | 22 | 6 | 6 | 0 | " | 10 | 0 | .. | | |
| 1839 | 18 | 0 | " | 20 | 0 | 8 | 0 | " | 12 | 0 | .. | | |
| 1840 | 15 | 0 | " | 0 | 0 | 7 | 0 | " | 0 | 0 | .. | | |
| 1841 | 15 | 0 | " | 16 | 9 | 6 | 0 | " | 7 | 5 | .. | | |
| 1842 | 12 | 6 | " | 14 | 0 | not quoted. | | .. | .. | .. | .. | | |
| 1843 | 9 | 0 | " | 11 | 6 | 5 | 0 | to | 6 | 0 | .. | | |
| 1844 | 15 | 0 | " | 18 | 0 | not quoted. | | .. | .. | .. | .. | | |
| 1845 | 14 | 6 | " | 17 | 6 | 7 | 6 | to | 8 | 6 | .. | | |
| 1846 | 12 | 0 | " | 14 | 6 | 8 | 0 | " | 8 | 6 | .. | | |
| 1847 | 12 | 6 | " | 14 | 0 | not quoted. | | .. | .. | .. | .. | | |
| 1848 | 9 | 6 | " | 11 | 0 | 4 | 9 | to | 0 | 0 | .. | | |
| 1849 | 12 | 0 | " | 16 | 6 | 6 | 0 | " | 6 | 3 | .. | | |
| 1850 | 15 | 0 | " | 17 | 6 | 8 | 0 | " | 8 | 6 | .. | | |
| 1851 | 12 | 0 | " | 16 | 0 | 8 | 0 | " | 9 | 3 | .. | | |
| 1852 | 13 | 0 | " | 15 | 0 | 8 | 0 | " | 9 | 0 | .. | | |
| 1853 | 19 | 0 | " | 22 | 0 | 11 | 0 | " | 12 | 6 | .. | | |
| 1854 | 12 | 0 | " | 15 | 0 | 7 | 6 | " | 8 | 6 | .. | | |
| 1855 | 14 | 6 | " | 19 | 0 | 8 | 6 | " | 9 | 0 | .. | | |
| 1856 | 19 | 0 | " | 21 | 6 | 11 | 0 | " | 0 | 0 | .. | | |
| 1857 | 19 | 0 | " | 24 | 0 | 13 | 0 | " | 14 | 3 | .. | | |
| 1858 | 15 | 0 | " | 17 | 0 | 8 | 9 | " | 10 | 0 | .. | | |
| 1859 | 18 | 6 | " | 24 | 0 | 10 | 9 | " | 11 | 6 | .. | | |
| 1860 | 22 | 0 | " | 32 | 0 | 10 | 0 | " | 11 | 3 | .. | | |
| 1861 | 19 | 6 | " | 27 | 0 | 37 0 to 38 0 from 30s. upwards. | | not quoted. | .. | .. | .. | | |
| 1862 | 18 | 6 | " | 26 | 0 | 30 | 0 | to | 37 | 0 | .. | | |
| 1863 | 25 | 6 | " | 31 | 0 | 38 | 0 | " | 42 | 0 | .. | | |
| 1864 | 31 | 0 | " | 39 | 0 | 47 | 0 | " | 54 | 0 | .. | | |
| 1865 | 23 | 0 | " | 30 | 0 | 44 | 0 | " | 45 | 0 | .. | | |
| 1866 | 24 | 0 | " | 30 | 0 | 30 | 0 | " | 38 | 0 | .. | | |
| 1867 | 16 | 0 | " | 21 | 6 | not quoted. | | not quoted. | .. | .. | .. | | |
| 1868 | 19 | 0 | " | 26 | 0 | 28 | 0 | to | 32 | 0 | .. | | |
| 1869 | 18 | 0 | " | 26 | 6 | not quoted. | | 8 | 6 | to | 9 | 0 | .. |
| 1870 | 15 | 0 | " | 23 | 6 | 25 | 0 | to | 26 | 0 | .. | | |
| 1871 | 20 | 0 | " | 26 | 6 | 30 | 0 | " | 34 | 6 | .. | | |
| 1872 | 26 | 0 | " | 37 | 6 | 40 | 0 | " | 48 | 0 | .. | | |
| 1873 | 17 | 0 | " | 18 | 0 | 34 | 0 | " | 40 | 0 | .. | | |
| 1874 | 18 | 6 | " | 26 | 6 | 30 | 0 | " | 34 | 0 | .. | | |
| 1875 | 25 | 0 | " | 32 | 0 | 34 | 6 | " | 36 | 0 | .. | | |
| 1876 | 20 | 0 | " | 24 | 0 | 30 | 0 | " | 34 | 6 | .. | | |
| 1877 | 20 | 9 | " | 26 | 0 | 28 | 0 | " | 30 | 0 | .. | | |
| 1878 | 18 | 0 | " | 25 | 0 | 27 | 0 | " | 32 | 0 | .. | | |
| 1879 | 15 | 0 | " | 17 | 0 | prices very low. | | 7 | 0 | " | 0 | .. | |
| 1880 | 20 | 0 | " | 24 | 0 | 30 | 0 | to | 32 | 0 | .. | | |
| 1881 | 17 | 0 | " | 21 | 0 | 27 | 0 | " | 30 | 0 | .. | | |
| 1882 | 14 | 0 | " | 18 | 0 | 27 | 6 | " | 28 | 0 | .. | | |
| 1883 | 13 | 0 | " | 18 | 0 | 26 | 0 | " | 28 | 0 | .. | | |
| 1884 | 13 | 0 | " | 18 | 0 | 26 | 0 | " | 28 | 0 | .. | | |
| 1885 | 12 | 0 | " | 17 | 0 | 22 | 6 | " | 26 | 0 | .. | | |
| 1886 | 13 | 0 | " | 18 | 0 | 23 | 0 | " | 27 | 6 | .. | | |
| 1887 | 14 | 0 | " | 22 | 0 | 23 | 0 | " | 28 | 0 | .. | | |
| 1888 | 13 | 0 | " | 20 | 0 | 23 | 0 | " | 28 | 0 | .. | | |
| 1889 | 13 | 0 | " | 18 | 0 | 24 | 0 | " | 28 | 0 | .. | | |
| 1890 | 13 | 0 | " | 18 | 0 | 24 | 0 | " | 28 | 0 | .. | | |
| 1891 | 12 | 6 | " | 18 | 0 | 22 | 6 | " | 28 | 0 | .. | | |
| 1892 | 12 | 0 | " | 18 | 0 | 20 | 0 | " | 28 | 0 | .. | | |
| 1893 | 12 | 0 | " | 17 | 0 | 20 | 0 | " | 27 | 0 | .. | | |
| 1894 | 12 | 0 | " | 16 | 0 | 20 | 0 | " | 26 | 0 | .. | | |
| 1895 | 12 | 0 | " | 16 | 0 | 20 | 0 | " | 25 | 0 | .. | | |

AGRICULTURAL STATISTICS.—RETURNED UPON 4TH JUNE 1895.—(Compiled from the Government Returns.)

TABLE No. 1.—ACREAGE UNDER EACH KIND OF CROP, BARE FALLOW, AND GRASS, IN EACH COUNTY OF SCOTLAND.

| COUNTIES. | CORN GROUP. | | | | | | | | | | TWIN GROUP. | | | | | Permanent Pasture (Arable Land) | Flax. | Small Fruit. | Arable or Uncropped Fallow. |
|--|-------------|-----------------|-----------|--------|--------|---------|-----------|-----------|----------|---------|-----------------------|-------------------|--------------------|---------|-------------------------------|---------------------------------|--------|--------------|-----------------------------|
| | Wheat. | Barley or Bere. | Oats. | Rye. | Beans. | P peas. | Total. | Potatoes. | Turnips. | Mangel. | Carrots, and Turnips. | Vetches or Tares. | Other Green Crops. | Total. | Clover, Grouse, and Rotation. | | | | |
| Total Acreage under Crops, Bare Fallow, and Grass. | Acres. | Acres. | Acres. | Acres. | Acres. | Acres. | Acres. | Acres. | Acres. | Acres. | Acres. | Acres. | Acres. | Acres. | Acres. | Acres. | Acres. | Acres. | Acres. |
| 1. Aberdeen | 990,070 | 17,017 | 196,755 | 289 | 115 | 943 | 215,730 | 7,245 | 91,647 | 9 | 73 | 2,514 | 221 | 101,700 | 270,380 | 35,711 | 3 | 332 | 190 |
| 2. Antrim | 134,063 | 1,430 | 18,063 | 177 | 74 | 2 | 49,444 | 4,901 | 5,004 | 43 | 31 | 25 | 33 | 10,414 | 96,900 | 75,522 | 29 | 725 | 173 |
| 3. Argyll | 321,902 | 1,462 | 40,317 | 177 | 369 | 8 | 49,444 | 8,607 | 7,685 | 451 | 489 | 39 | 325 | 17,472 | 97,986 | 1,56,779 | 160 | 173 | 725 |
| 4. Banff | 100,210 | 7,517 | 50,018 | 157 | 100 | 43 | 57,510 | 1,963 | 1,963 | 1 | 1,078 | 21 | 21 | 35,608 | 62,801 | 13,960 | 2 | 20 | 110 |
| 5. Berwick | 191,983 | 20,055 | 51,392 | 12 | 521 | 73 | 57,510 | 2,300 | 28,314 | 83 | 430 | 486 | 31 | 32,175 | 58,391 | 44,118 | 21 | 47 | 110 |
| 6. Bute | 25,005 | 131 | 5,000 | 122 | 41 | 5 | 5,000 | 1,636 | 1,636 | 10 | 107 | 425 | 10 | 2,900 | 8,763 | 8,763 | 63 | 116 | 116 |
| 7. Caithness | 110,020 | 31,472 | 69 | 69 | 1 | 12 | 37,463 | 1,638 | 13,978 | 10 | 107 | 425 | 10 | 16,184 | 29,748 | 28,505 | 8 | 35 | 35 |
| 8. Clackmannan | 15,687 | 428 | 5,552 | 10 | 500 | 1 | 4,703 | 973 | 1,117 | 1 | 113 | 118 | 1 | 1,244 | 3,945 | 6,110 | 10 | 236 | 35 |
| 9. Dumfriesshire | 50,513 | 510 | 7,110 | 21 | 118 | 3 | 4,703 | 973 | 1,117 | 1 | 113 | 118 | 1 | 1,244 | 3,945 | 6,110 | 10 | 236 | 35 |
| 10. Dundee | 250,928 | 291 | 7,110 | 21 | 118 | 3 | 4,703 | 973 | 1,117 | 1 | 113 | 118 | 1 | 1,244 | 3,945 | 6,110 | 10 | 236 | 35 |
| 11. Edinburgh | 138,391 | 5,709 | 24,640 | 10 | 156 | 81 | 33,014 | 4,311 | 12,037 | 51 | 915 | 441 | 381 | 24,906 | 83,731 | 61,230 | 76 | 844 | 108 |
| 12. Elgin | 101,768 | 13,065 | 21,758 | 867 | 18 | 20 | 36,222 | 1,079 | 12,821 | 6 | 22 | 443 | 57 | 17,600 | 37,943 | 9,578 | 2 | 95 | 91 |
| 13. Fife | 255,000 | 7,075 | 41,214 | 1,290 | 1,019 | 18 | 74,028 | 15,800 | 35,067 | 27 | 270 | 800 | 57 | 42,550 | 63,195 | 75,691 | 1 | 103 | 614 |
| 14. Forfar | 293,309 | 28,131 | 51,032 | 800 | 600 | 37 | 87,837 | 17,680 | 35,067 | 12 | 111 | 613 | 111 | 48,324 | 84,428 | 30,771 | 3 | 101 | 61 |
| 15. Inverclyde | 113,119 | 3,619 | 7,704 | 27 | 410 | 43 | 38,042 | 7,809 | 16,514 | 130 | 411 | 249 | 223 | 26,875 | 91,124 | 10,018 | 1 | 385 | 974 |
| 16. Inverness | 150,795 | 2 | 6,801 | 702 | 11 | 13 | 37,853 | 6,297 | 10,868 | 11 | 39 | 131 | 18 | 17,844 | 29,257 | 66,132 | 61 | 388 | 388 |
| 17. Kinross | 120,008 | 10,888 | 30,327 | 63 | 517 | 44 | 42,047 | 2,601 | 17,934 | 8 | 440 | 30 | 30 | 21,073 | 4,628 | 8,611 | 1 | 80 | 10 |
| 18. Kirkcaldy | 35,816 | 947 | 6,588 | 27 | 26 | 4 | 6,892 | 668 | 2,752 | 67 | 67 | 47 | 3 | 3,929 | 13,763 | 13,763 | 10 | 10 | 10 |
| 19. Kirkcubright | 191,028 | 1,560 | 27,601 | 77 | 27 | 1 | 27,890 | 1,512 | 13,818 | 4 | 1,336 | 40 | 3 | 10,808 | 60,998 | 86,100 | 32 | 921 | 921 |
| 20. Leven | 236,747 | 1,460 | 33,604 | 42 | 619 | 22 | 41,510 | 4,461 | 9,713 | 20 | 1,429 | 372 | 227 | 10,225 | 108,043 | 85,567 | 2 | 2,063 | 327 |
| 21. Leithgow | 59,090 | 814 | 3,308 | 10,101 | 97 | 302 | 15,078 | 1,704 | 4,179 | 2 | 102 | 251 | 10 | 6,248 | 13,192 | 23,524 | 52 | 116 | 116 |
| 22. Nairn | 35,709 | 16 | 6,657 | 169 | 1 | 25 | 9,054 | 925 | 4,257 | 2 | 9 | 39 | 1 | 4,680 | 8,026 | 9,337 | 3 | 69 | 69 |
| 23. Orkney | 106,188 | 4,641 | 33,587 | 1 | 10 | 87 | 38,625 | 2,890 | 14,377 | 3 | 453 | 286 | 1 | 17,695 | 82,283 | 17,644 | 211 | 480 | 480 |
| 24. Shetland | 7,607 | 2,063 | 7,305 | 1 | 1 | 1 | 9,342 | 8,170 | 1,831 | 3 | 453 | 286 | 1 | 17,695 | 82,283 | 17,644 | 211 | 480 | 480 |
| 25. Perth | 46,814 | 10 | 422 | 8,201 | 5 | 24 | 8,782 | 438 | 4,329 | 6 | 176 | 415 | 68 | 44,234 | 98,265 | 103,284 | 5 | 747 | 1,188 |
| 26. Raith | 337,227 | 3,708 | 17,732 | 657 | 2,261 | 17 | 80,474 | 13,717 | 29,913 | 25 | 202 | 45 | 56 | 62,216 | 21,487 | 62,216 | 89 | 133 | 133 |
| 27. Renfrew | 39,907 | 1,335 | 12,241 | 67 | 268 | 3 | 14,078 | 9,220 | 2,843 | 25 | 202 | 45 | 56 | 62,216 | 21,487 | 62,216 | 89 | 133 | 133 |
| 28. Ross & Cromarty | 137,703 | 444 | 11,308 | 32,133 | 872 | 8 | 44,878 | 7,806 | 16,730 | 5 | 6 | 000 | 11 | 25,809 | 40,405 | 26,057 | 19 | 135 | 135 |
| 29. Roxburgh | 180,062 | 131 | 12,756 | 90,750 | 4 | 55 | 21 | 43,200 | 1,442 | 23,067 | 2 | 448 | 341 | 22 | 56,745 | 56,408 | 70 | 47 | 47 |
| 30. Selkirk | 30,393 | 1 | 354 | 4,932 | 4 | 8 | 5,279 | 205 | 2,094 | 2 | 162 | 57 | 2 | 3,410 | 9,546 | 12,005 | 65 | 28 | 28 |
| 31. Stirling | 118,704 | 1,450 | 18,446 | 131 | 2,932 | 84 | 26,780 | 9,602 | 4,519 | 0 | 265 | 828 | 8 | 8,732 | 32,671 | 49,362 | 138 | 1,111 | 1,111 |
| 32. Sutherland | 31,816 | 1 | 3,497 | 8,001 | 107 | 12 | 6,322 | 1,673 | 3,117 | 0 | 265 | 828 | 8 | 4,887 | 8,207 | 9,078 | 5 | 47 | 47 |
| 33. Wigton | 182,993 | 256 | 31,498 | 20 | 163 | 6 | 30,059 | 1,484 | 10,335 | 90 | 103 | 115 | 150 | 18,907 | 65,393 | 92,910 | 13 | 221 | 221 |
| Total | 4,894,406 | 23,709 | 1,008,280 | 7,414 | 12,009 | 995 | 1,878,990 | 134,832 | 492,051 | 1,144 | 9,156 | 11,322 | 2,185 | 640,270 | 1,574,618 | 1,387,259 | 21 | 5,220 | 5,220 |

TABLE No. 2.—NUMBER OF HORSES, CATTLE, SHEEP, AND PIGS IN EACH COUNTY OF SCOTLAND AS RETURNED ON JUNE 4, 1895.

| COUNTIES. | HORSES (including Ponies). | | | CATTLE. | | | SHEEP. | | | Pigs. | | |
|-----------------------|----------------------------------|------------------|---------------------------------|---------|--------------------------------------|--------------------|----------------|-----------|-----------------------|-----------|---------------|---------|
| | Used solely for Agriculture, &c. | Unbroken Horses. | Mares kept solely for breeding. | Total. | Cows and Heifers in Milk or in Calf. | Other Cattle. | | Total. | 1 Year Old and above. | | Under 1 Year. | Total. |
| | | | | | | 2 Years and above. | Under 2 Years. | | | | | |
| 1. Aberdeen | 23,116 | 7,060 | 838 | 31,114 | 43,407 | 46,770 | 83,694 | 173,901 | 120,371 | 63,680 | 183,651 | 10,379 |
| 2. Argyll | 4,347 | 2,419 | 359 | 7,025 | 22,446 | 12,831 | 34,728 | 60,005 | 705,267 | 918,114 | 1,023,351 | 4,381 |
| 3. Argyll | 6,911 | 2,594 | 460 | 9,974 | 60,373 | 13,530 | 84,785 | 98,842 | 219,509 | 141,548 | 361,057 | 16,768 |
| 4. Banff | 6,510 | 2,292 | 79 | 8,881 | 12,470 | 6,509 | 24,046 | 41,764 | 383,306 | 24,307 | 407,703 | 2,401 |
| 5. Berwick | 4,870 | 1,245 | 221 | 6,336 | 3,100 | 5,220 | 7,016 | 15,986 | 166,828 | 141,537 | 307,365 | 4,580 |
| 6. Bute | 1,011 | 371 | 61 | 1,443 | 3,838 | 2,441 | 4,260 | 6,939 | 102,384 | 16,835 | 119,219 | 887 |
| 7. Caithness | 4,274 | 1,227 | 79 | 5,680 | 7,417 | 3,223 | 11,006 | 21,616 | 68,026 | 40,596 | 108,621 | 1,806 |
| 8. Clackmannan | 1,494 | 178 | 687 | 2,359 | 6,080 | 963 | 1,440 | 4,042 | 8,113 | 4,849 | 12,962 | 2,985 |
| 9. Dumfriesshire | 1,463 | 514 | 75 | 2,052 | 8,203 | 2,560 | 3,913 | 14,070 | 48,853 | 26,179 | 75,032 | 1,887 |
| 10. Dumfriesshire | 6,681 | 2,092 | 217 | 7,990 | 19,489 | 12,101 | 26,477 | 58,007 | 921,890 | 208,011 | 1,129,901 | 11,351 |
| 11. Edinburgh | 3,700 | 744 | 90 | 4,540 | 11,006 | 4,111 | 4,224 | 19,451 | 108,819 | 75,003 | 183,822 | 8,183 |
| 12. Elgin | 9,891 | 1,253 | 68 | 11,211 | 6,107 | 4,083 | 11,200 | 21,489 | 89,089 | 22,003 | 111,092 | 2,771 |
| 13. Fife | 7,821 | 2,546 | 168 | 10,535 | 11,255 | 17,392 | 19,335 | 47,012 | 55,754 | 88,324 | 146,078 | 6,582 |
| 14. Forfar | 8,371 | 1,901 | 101 | 10,653 | 11,684 | 19,137 | 18,092 | 49,163 | 91,200 | 55,129 | 146,329 | 7,951 |
| 15. Haddington | 3,263 | 476 | 49 | 3,788 | 1,808 | 4,579 | 3,119 | 9,066 | 76,308 | 61,175 | 137,483 | 2,158 |
| 16. Inverness | 6,695 | 2,018 | 155 | 8,872 | 21,201 | 7,458 | 23,080 | 51,799 | 448,085 | 197,515 | 645,600 | 3,019 |
| 17. Kinross | 4,178 | 1,290 | 55 | 5,483 | 6,918 | 6,553 | 12,062 | 26,131 | 24,057 | 13,478 | 37,535 | 2,680 |
| 18. Kirkcubright | 788 | 978 | 13 | 1,779 | 1,196 | 1,359 | 4,892 | 9,948 | 20,786 | 16,453 | 37,239 | 515 |
| 19. Leamington | 6,381 | 2,047 | 240 | 8,668 | 10,256 | 13,165 | 18,792 | 48,213 | 246,831 | 186,284 | 433,116 | 7,892 |
| 20. Leamington | 6,381 | 2,047 | 240 | 8,668 | 10,256 | 13,165 | 18,792 | 48,213 | 246,831 | 186,284 | 433,116 | 7,892 |
| 21. Leithgow | 1,546 | 570 | 57 | 2,173 | 8,292 | 11,486 | 21,659 | 17,997 | 146,289 | 87,374 | 233,663 | 8,500 |
| 22. Nairn | 1,022 | 404 | 7 | 1,433 | 4,572 | 3,256 | 4,090 | 11,018 | 10,869 | 5,380 | 16,249 | 2,085 |
| 23. Orkney | 4,875 | 1,407 | 68 | 6,350 | 1,773 | 876 | 3,530 | 6,190 | 12,935 | 5,380 | 18,315 | 681 |
| 24. Shetland | 769 | 2,473 | 2,241 | 5,503 | 9,390 | 3,823 | 13,019 | 26,832 | 10,165 | 15,890 | 32,060 | 3,580 |
| 25. Peebles | 914 | 239 | 23 | 1,176 | 7,768 | 4,690 | 6,425 | 18,883 | 61,665 | 40,433 | 102,098 | 2,901 |
| 26. Perth | 10,297 | 3,220 | 300 | 13,817 | 2,112 | 1,873 | 3,304 | 6,789 | 108,246 | 77,975 | 186,221 | 8,880 |
| 27. Renfrew | 2,557 | 810 | 181 | 3,548 | 18,202 | 20,233 | 36,420 | 74,861 | 480,385 | 227,276 | 707,661 | 5,201 |
| 28. Ross and Cromarty | 5,992 | 1,038 | 130 | 7,060 | 16,808 | 8,102 | 6,216 | 26,195 | 15,608 | 15,608 | 31,716 | 1,554 |
| 29. Roxburgh | 3,761 | 573 | 138 | 4,468 | 17,622 | 7,546 | 10,955 | 41,922 | 210,107 | 104,802 | 314,909 | 5,988 |
| 30. Selkirk | 619 | 98 | 21 | 738 | 4,084 | 4,997 | 7,046 | 17,327 | 286,149 | 224,078 | 510,227 | 3,988 |
| 31. Stirling | 3,698 | 1,512 | 153 | 5,363 | 1,343 | 660 | 1,515 | 3,418 | 79,003 | 77,886 | 156,889 | 2,077 |
| 32. Sutherland | 2,123 | 507 | 48 | 2,678 | 11,744 | 9,207 | 11,038 | 32,589 | 79,903 | 48,881 | 128,784 | 3,055 |
| 33. Wigtown | 4,155 | 2,111 | 235 | 6,501 | 24,007 | 7,906 | 16,310 | 48,923 | 143,108 | 60,537 | 203,645 | 2,677 |
| Total | 149,844 | 51,069 | 6,713 | 207,323 | 423,907 | 204,293 | 489,087 | 1,177,947 | 4,008,100 | 2,025,674 | 7,238,783 | 153,220 |

TABLE NO. 3.—QUANTITIES AND VALUES OF CORN, MEAT, FOOD PRODUCTS,
in the Years 1893,

[From Trade and

| | Quantities. | | | Values. | | |
|--|-------------|------------|------------|------------|------------|------------|
| | 1893. | 1894. | 1895. | 1893. | 1894. | 1895. |
| ANIMALS, LIVING (for food):— | No. | No. | No. | £ | £ | £ |
| Oxen and bulls . . . | 337,063 | 471,704 | 413,337 | 6,213,447 | 8,235,007 | 7,150,312 |
| Cows | 2,908 | 3,513 | 1,880 | 48,996 | 59,298 | 31,049 |
| Calves | 74 | 123 | 348 | 318 | 679 | 1,179 |
| Total cattle . . . | 340,045 | 475,440 | 415,565 | 6,262,761 | 8,285,044 | 7,183,040 |
| Sheep and lambs . . | 62,682 | 484,507 | 1,065,470 | 83,530 | 804,823 | 1,782,544 |
| Swine | 125 | 8 | 321 | 413 | 16 | 668 |
| Total value . . . | .. | .. | .. | 6,351,704 | 9,089,888 | 8,966,252 |
| CORN:— | Cwt. | Cwt. | Cwt. | £ | £ | £ |
| Wheat | 65,461,885 | 70,126,232 | 81,749,955 | 21,070,028 | 18,760,305 | 22,520,171 |
| Wheat meal and flour | 20,408,163 | 19,134,005 | 1,368,410 | 9,761,510 | 7,904,673 | 7,679,017 |
| Bury | 22,844,562 | 31,241,394 | 23,618,837 | 5,776,033 | 7,090,579 | 5,538,405 |
| Oats | 13,954,956 | 14,979,214 | 15,528,310 | 4,297,986 | 3,900,096 | 3,723,415 |
| Peas | 2,302,443 | 2,272,623 | 2,422,351 | 729,294 | 647,104 | 693,828 |
| Beans | 3,946,985 | 5,239,895 | 4,130,538 | 1,127,559 | 1,346,096 | 1,079,780 |
| Maize | 32,002,508 | 35,965,043 | 33,044,350 | 7,892,629 | 7,952,238 | 7,808,870 |
| Maize-meal | 70,784 | 87,120 | 164,200 | 37,330 | 40,968 | 75,523 |
| Other kinds of corn and meal | .. | .. | .. | 488,002 | 487,876 | 593,243 |
| Total value . . . | .. | .. | .. | 51,180,371 | 48,220,225 | 49,718,252 |
| MEAT:— | Cwt. | Cwt. | Cwt. | £ | £ | £ |
| Beef, salted | 200,514 | 242,311 | 213,956 | 278,997 | 342,814 | 286,511 |
| fresh | 1,809,051 | 2,104,104 | 2,190,507 | 3,800,596 | 4,213,688 | 4,275,548 |
| Mutton, fresh . . . | 1,971,500 | 2,205,006 | 2,610,375 | 3,573,863 | 4,341,227 | 4,593,066 |
| Pig | 3,198,857 | 3,081,604 | 4,003,418 | 8,479,515 | 8,083,887 | 7,935,799 |
| Hams | 488,411 | 1,129,784 | 1,289,518 | 2,890,252 | 2,771,528 | 2,897,477 |
| Pork, salted (not Hams) | 186,901 | 225,010 | 220,105 | 280,577 | 355,556 | 260,820 |
| Pork, fresh | 182,091 | 180,883 | 288,537 | 455,344 | 436,546 | 605,223 |
| Meat, (enumerated) — salted or fresh | 177,509 | 180,757 | 237,225 | 399,912 | 410,724 | 490,555 |
| Meat preserved otherwise than by salting | 500,800 | 554,866 | 856,253 | 1,545,211 | 1,400,902 | 2,040,045 |
| Rabbits | 103,823 | 108,476 | 120,279 | 287,737 | 297,818 | 315,585 |
| Total | 9,408,627 | 10,718,870 | 12,066,321 | 22,831,504 | 22,724,990 | 23,769,638 |
| DAIRY PRODUCE:— | Cwt. | Cwt. | Cwt. | £ | £ | £ |
| Butter | 2,327,474 | 2,574,885 | 2,825,682 | 12,753,598 | 13,450,699 | 14,245,230 |
| Margarine | 1,290,970 | 1,109,325 | 940,168 | 3,655,344 | 3,044,810 | 2,557,170 |
| Cheese | 2,077,462 | 2,266,145 | 2,133,800 | 5,160,918 | 5,474,940 | 4,674,181 |
| Total | 5,704,906 | 5,950,305 | 5,899,650 | 21,569,855 | 21,976,449 | 21,476,581 |

AND ARTICLES AFFECTING AGRICULTURE, imported into the United Kingdom 1894, and 1895.

Navigation Returns.]

| | Quantities. | | | Values. | | |
|---|--------------------------|--------------------------|--------------------------|----------------|----------------|----------------|
| | 1893. | 1894. | 1895. | 1893. | 1894. | 1895. |
| POULTRY, &c. :— | | | | | | |
| Poultry and game, } alive or dead | .. | .. | .. | £ 578,959 | £ 480,384 | £ 605,166 |
| Eggs | Gt. Hunds. 11,045,986 | Gt. Hunds. 11,876,968 | Gt. Hunds. 12,722,292 | 3,875,647 | 3,786,329 | 4,008,440 |
| Total | .. | .. | .. | 4,454,606 | 4,267,213 | 4,608,606 |
| FRUIT, VEGETABLES, &c. :— | | | | | | |
| Apples | Bushels. 3,459,984 | Bushels. 4,908,669 | Bushels. 3,292,562 | £ 843,532 | £ 1,380,421 | £ 960,273 |
| Cherries | 346,148 | 311,215 | 195,627 | 194,584 | 166,899 | 96,043 |
| Plums | 777,142 | 777,411 | 401,080 | 331,622 | 302,105 | 166,045 |
| Pears | 915,212 | 1,310,074 | 407,146 | 347,189 | 411,316 | 166,706 |
| Grapes | 078,505 | 832,893 | 865,285 | 530,448 | 470,428 | 486,078 |
| Oranges and lemons . | 5,674,747 | 7,882,994 | 8,864,329 | 1,703,761 | 2,206,217 | 2,476,410 |
| Unenumerated . . | 1,079,794 | 1,300,518 | 1,251,231 | 447,979 | 568,569 | 513,370 |
| Onions | 4,671,800 | 5,338,512 | 5,734,768 | 783,405 | 765,040 | 696,428 |
| Potatoes | 2,828,125 | 2,703,803 | 3,758,161 | 906,952 | 1,030,091 | 1,170,302 |
| Vegetables, unenum- } erated (raw) | .. | .. | .. | 1,076,749 | 1,090,370 | 1,277,058 |
| Hops | 204,392 | 189,155 | 217,161 | 1,141,204 | 774,378 | 644,505 |
| Total value | .. | .. | .. | 8,307,215 | 9,170,124 | 8,654,118 |
| OTHER ARTICLES :— | | | | | | |
| Lard | Cwt. 1,118,106 | Cwt. 1,400,510 | Cwt. 1,742,688 | £ 2,803,549 | £ 2,758,410 | £ 2,941,941 |
| Flax | 1,445,360 | 1,434,020 | 2,055,100 | 2,517,953 | 2,525,105 | 3,270,851 |
| Wool, sheep, and } lambs' | Lb. 672,763,274 | Lb. 700,550,262 | Lb. 770,961,380 | 24,438,898 | 24,791,160 | 26,031,550 |
| Wood and timber— | | | | | | |
| Hewn | Loads. 2,120,688 | Loads. 2,338,002 | Loads. 2,278,548 | 4,018,743 | 4,187,763 | 4,201,370 |
| Sawn or split, } planed or dressed | 4,761,717 | 5,446,487 | 5,065,798 | 10,265,942 | 11,896,533 | 10,716,249 |
| Staves | 131,708 | 132,145 | 144,751 | 512,311 | 541,797 | 594,605 |
| Oilseed cake . . . | Tons. 283,542 | Tons. 274,351 | Tons. 313,187 | 1,939,774 | 1,707,358 | 1,605,150 |
| Seeds— | | | | | | |
| Clover and grass . | Cwt. 333,412 | Cwt. 343,118 | Cwt. 402,020 | 792,061 | 825,155 | 855,612 |
| Cotton | Tons. 369,859 | Tons. 366,886 | Tons. 374,111 | 2,409,042 | 2,052,085 | 1,750,487 |
| Flax and linseed . | Qrs. 1,760,581 | Qrs. 2,087,060 | Qrs. 1,961,637 | 3,475,290 | 3,941,995 | 3,852,810 |
| Rape | 252,560 | 299,046 | 325,388 | 313,424 | 310,189 | 307,348 |
| Bones (whether burnt or not) | Tons. 44,924 | Tons. 88,664 | Tons. 74,056 | 198,592 | 412,529 | 320,054 |
| Guano | 18,311 | 28,582 | 49,840 | 94,721 | 146,361 | 392,305 |
| Cotton, raw . . . | Cwt. 12,649,822 | Cwt. 15,965,326 | Cwt. 15,687,883 | 30,684,942 | 32,944,341 | 30,429,070 |
| Hemp | 1,628,740 | 1,670,820 | 1,958,740 | 2,115,951 | 1,897,943 | 2,036,425 |
| Hides untanned— | | | | | | |
| Dry | 357,115 | 419,205 | 491,642 | 932,036 | 988,912 | 1,153,941 |
| Wet | 589,198 | 608,584 | 771,186 | 1,240,217 | 1,242,168 | 1,651,756 |
| Petroleum | Gallons. 153,125,667 | Gallons. 163,002,262 | Gallons. 177,146,628 | 2,546,760 | 2,434,976 | 3,368,904 |

TABLE NO. 4.—NUMBER AND VALUE OF LIVE CATTLE, SHEEP, AND SWINE imported into the United Kingdom in the Three Years 1893-95.

[From Trade and Navigation Returns.]

| | Number. | | | Value. | | |
|-------------------------------|---------|---------|-----------|-----------|-----------|-----------|
| | 1893. | 1894. | 1895. | 1893. | 1894. | 1895. |
| OXEN AND BULLS, from:— | | | | £ | £ | £ |
| Denmark | ... | ... | ... | ... | ... | ... |
| Spain | ... | ... | ... | ... | ... | ... |
| Canada | 81,232 | 80,450 | 95,747 | 1,436,479 | 1,315,779 | 1,589,034 |
| United States | 215,825 | 381,657 | 276,307 | 4,667,152 | 6,758,843 | 4,915,834 |
| Other countries . . . | 7,006 | 9,657 | 41,283 | 109,816 | 150,445 | 645,044 |
| Total | 337,063 | 471,794 | 413,337 | 6,213,447 | 8,225,067 | 7,150,812 |
| COWS, from:— | | | | | | |
| Denmark | ... | ... | ... | ... | ... | ... |
| Sweden | ... | ... | ... | ... | ... | ... |
| Canada | 1,690 | 1,868 | 234 | 28,526 | 30,581 | 3,338 |
| United States | 66 | 265 | 31 | 1,114 | 4,411 | 511 |
| Other countries . . . | 1,152 | 1,380 | 1,615 | 19,326 | 24,306 | 27,200 |
| Total | 2,908 | 3,513 | 1,880 | 48,996 | 59,298 | 31,049 |
| CALVES, from:— | | | | | | |
| Denmark | ... | ... | ... | ... | ... | ... |
| Holland | ... | ... | ... | ... | ... | ... |
| Canada | 3 | 5 | 12 | 13 | 13 | 32 |
| Other countries . . . | 71 | 123 | 336 | 305 | 666 | 1,147 |
| Total | 74 | 133 | 348 | 318 | 679 | 1,179 |
| SHEEP AND LAMBS, from:— | | | | | | |
| Denmark | 129,227 | 165,439 | 65,046 | 185,254 | 180,417 | 181,656 |
| Germany | ... | ... | ... | ... | ... | ... |
| Holland | ... | ... | ... | ... | ... | ... |
| Canada | 3,589 | 136,422 | 214,310 | 6,782 | 236,108 | 387,181 |
| United States | ... | 198,133 | 153,250 | ... | 314,843 | 769,864 |
| Other countries . . . | 29,806 | 85,308 | 332,864 | 46,494 | 143,460 | 543,813 |
| Total | 62,682 | 485,597 | 1,065,470 | 88,530 | 804,823 | 1,782,514 |
| SWINE, from:— | | | | | | |
| Denmark | ... | ... | ... | ... | ... | ... |
| Holland | ... | ... | ... | ... | ... | ... |
| United States | ... | ... | 191 | ... | ... | 345 |
| Other countries . . . | 138 | 8 | 130 | 413 | 16 | 323 |
| Total | 138 | 8 | 321 | 413 | 16 | 668 |
| TOTAL VALUE OF ALL KINDS } | ... | ... | ... | 6,351,704 | 9,039,883 | 8,966,252 |

¹ Imported from Iceland. This island, in these Returns, is included with Denmark, and animals from thence are allowed to be landed.

TABLE No 5—PRICES OF LIVE STOCK IN 1894 AND 1895, as returned under the Markets and Fairs (Weighing of Cattle) Act, 1891.

[From Journal of the Board of Agriculture.]

NUMBER OF ANIMALS REPORTED AS ENTERING THE 19 SCHEDULED PLACES IN GREAT BRITAIN, TOGETHER WITH THE NUMBERS WEIGHED AND THE NUMBERS PRICED.

| ANIMALS | 1895 | 1894. | 1893. |
|---|-----------|-----------|-----------|
| CATTLE :— | No | No | No |
| Entering markets | 1,186,149 | 1,203,533 | 1,219,208 |
| Weighed | 100,033 | 96,344 | 92,492 |
| Prices returned | 88,403 | 84,593 | 84,403 |
| Prices returned with breed and quality distinguished | 64,072 | 58,559 | 57,323 |
| SHEEP :— | | | |
| Entering markets | 4,330,256 | 4,649,277 | 4,654,732 |
| Weighed | 34,886 | 39,210 | 38,177 |
| Prices returned with breed and quality distinguished | 23,577 | 26,072 | 28,180 |
| SWINE :— | | | |
| Entering markets | 233,189 | 139,187 | 191,376 |
| Weighed | 2,803 | 2,495 | 1,450 |
| Prices returned | 1,226 | 523 | 401 |
| Prices returned with breed and quality distinguished | 17 | 56 | 6 |

CALCULATED AVERAGE PRICE PER LIVE CWT. IN EIGHT
SELECTED PLACES.(Obtained by dividing the total price by the total weight of the weighed animals
of all descriptions in each of the three qualities or grades.)

| PLACES | Inferior or third quality | | Good or second quality | | Prime or first quality | |
|----------------------|------------------------------|----------------|---------------------------|----------------|---------------------------|----------------|
| | 1895. | 1894. | 1895 | 1894. | 1895 | 1894. |
| ENGLAND :— | Per cwt s d | Per cwt s d | Per cwt s d | Per cwt s d | Per cwt s d | Per cwt s d |
| Liverpool | ... | ... | 27 10 | 28 4 | 33 8 | 32 4 |
| London | 29 6 | 26 4 | 34 4 | 34 0 | 38 0 | 38 6 |
| Newcastle | .. | .. | 33 0 | 34 0 | 35 4 | 35 4 |
| Shrewsbury | 25 10 | 24 8 | 30 6 | 28 2 | 33 10 | 32 0 |
| SCOTLAND :— | | | | | | |
| Aberdeen | 25 3 | 24 6 | 32 9 | 32 3 | 36 8 | 36 3 |
| Dundee | 27 3 | 26 2 | 33 2 | 31 10 | 35 3 | 34 2 |
| Edinburgh | 28 7 | 26 6 | 34 6 | 33 4 | 35 1 | 34 8 |
| Perth | 31 10 | 30 4 | 33 5 | 32 1 | 35 11 | 34 4 |

TABLE NO. 6.—QUANTITIES AND VALUES OF BUTTER, MARGARINE, CHEESE, AND EGGS imported into the United Kingdom in the Three Years 1893-95 inclusive.

[From Trade and Navigation Returns.]

| | QUANTITIES. | | | VALUE. | | |
|------------------|-----------------|-----------------|-----------------|------------|------------|------------|
| | 1893. | 1894. | 1895. | 1893. | 1894. | 1895. |
| BUTTER from:— | Cwt. | Cwt. | Cwt. | £ | £ | £ |
| Sweden . . | 267,401 | 266,306 | 310,809 | 1,452,099 | 1,413,779 | 1,644,111 |
| Denmark . . | 934,787 | 1,102,493 | 1,162,770 | 5,278,875 | 5,843,954 | 5,948,463 |
| Germany . . | 164,985 | 187,755 | 112,338 | 830,706 | 702,960 | 565,093 |
| Holland . . | 142,311 | 165,157 | 191,221 | 763,897 | 831,951 | 939,326 |
| France . . | 468,317 | 424,645 | 454,843 | 2,679,120 | 2,351,867 | 2,444,734 |
| Australasia . | 169,439 | 292,097 | 313,398 | 870,674 | 1,429,977 | 1,424,585 |
| Canada . . | 43,160 | 20,857 | 38,949 | 194,924 | 90,121 | 153,401 |
| United States . | 22,930 | 29,996 | 66,932 | 104,220 | 125,947 | 271,776 |
| Other countries | 113,644 | 135,499 | 174,422 | 579,078 | 666,143 | 853,741 |
| Total . | 2,327,474 | 2,574,835 | 2,825,682 | 12,753,593 | 13,456,699 | 14,245,230 |
| MARGARINE from:— | Cwt. | Cwt. | Cwt. | £ | £ | £ |
| Norway . . | 14,011 | 10,330 | 9,377 | 38,761 | 29,369 | 25,259 |
| Holland . . | 1,229,737 | 1,045,330 | 878,827 | 3,416,497 | 2,834,804 | 2,371,711 |
| France . . | 41,302 | 29,052 | 28,132 | 160,377 | 115,719 | 99,733 |
| Other countries | 14,920 | 24,613 | 23,832 | 39,709 | 64,889 | 60,467 |
| Total . | 1,299,970 | 1,109,325 | 940,168 | 3,655,344 | 3,044,781 | 2,557,170 |
| CHEESE from:— | Cwt. | Cwt. | Cwt. | £ | £ | £ |
| Holland . . | 240,364 | 298,693 | 305,920 | 676,001 | 780,835 | 774,790 |
| France . . | 58,346 | 52,969 | 56,393 | 181,763 | 163,335 | 175,541 |
| Australasia . | 37,114 | 54,373 | 92,759 | 96,316 | 137,520 | 219,645 |
| Canada . . | 1,046,764 | 1,142,104 | 1,150,018 | 2,375,893 | 2,688,946 | 2,334,598 |
| United States . | 645,235 | 672,347 | 500,409 | 1,578,531 | 1,608,405 | 1,099,284 |
| Other countries | 20,699 | 45,654 | 28,310 | 52,414 | 115,899 | 70,323 |
| Total . | 2,077,462 | 2,266,145 | 2,133,809 | 5,160,918 | 5,474,940 | 4,674,181 |
| EGGS from:— | Great Hundreds. | Great Hundreds. | Great Hundreds. | £ | £ | £ |
| Russia . . | 1,524,615 | 1,369,959 | 2,229,630 | 426,106 | 383,639 | 601,460 |
| Denmark . . | 1,039,013 | 1,254,914 | 1,279,013 | 376,793 | 422,790 | 447,709 |
| Germany . . | 2,129,154 | 3,361,188 | 3,406,584 | 618,631 | 937,087 | 916,821 |
| Belgium . . | 2,040,692 | 2,954,843 | 2,361,680 | 682,636 | 885,136 | 713,458 |
| France . . | 3,520,636 | 2,440,539 | 2,730,332 | 1,611,495 | 982,800 | 1,069,580 |
| Canada . . | 207,374 | 254,604 | 436,903 | 75,506 | 92,644 | 156,653 |
| Other countries | 234,502 | 240,901 | 278,150 | 84,480 | 82,233 | 97,759 |
| Total . | 11,045,986 | 11,876,968 | 12,722,202 | 3,875,647 | 3,786,329 | 4,003,440 |

TABLE NO. 7.—NUMBER OF HORSES, CATTLE, SHEEP, AND PIGS imported into Great Britain from Ireland in the Seven Years 1889-95.

| | 1889. | 1890. | 1891. | 1892. | 1893. | 1894. | 1895. |
|--|---------|---------|---------|-----------|-----------|---------|---------|
| HORSES :— | | | | | | | |
| Stallions . . . | 80 | 105 | 125 | 113 | 151 | 163 | 188 |
| Mares . . . | 13,647 | 14,625 | 14,055 | 14,273 | 13,356 | 14,484 | 15,370 |
| Geldings . . . | 18,097 | 19,422 | 19,216 | 18,095 | 16,383 | 18,942 | 19,002 |
| Total . . . | 31,824 | 34,152 | 33,396 | 32,481 | 30,390 | 33,589 | 34,560 |
| CATTLE, OVEN, BULLS, and COWS.— | | | | | | | |
| Fat . . . | 248,362 | 216,399 | 240,183 | 256,538 | 316,344 | 330,748 | 302,555 |
| Store . . . | 372,082 | 360,758 | 321,075 | 305,373 | 318,745 | 422,534 | 414,859 |
| Other cattle . . . | 1,432 | 1,152 | 3,985 | 6,278 | 8,473 | 7,505 | 5,022 |
| Calves . . . | 47,807 | 53,449 | 63,559 | 56,278 | 47,307 | 65,867 | 68,571 |
| Total . . . | 669,543 | 631,698 | 630,802 | 624,467 | 692,869 | 826,654 | 791,007 |
| SHEEP :— | | | | | | | |
| Sheep . . . | 373,313 | 337,220 | 569,698 | 713,528 | 705,299 | 574,471 | 551,975 |
| Lambs . . . | 240,371 | 249,761 | 323,477 | 366,674 | 402,661 | 382,630 | 300,609 |
| Total . . . | 613,684 | 586,981 | 893,175 | 1,080,202 | 1,107,960 | 957,101 | 852,584 |
| PIGS — | | | | | | | |
| Fat . . . | 428,103 | 543,417 | 459,596 | 457,977 | 405,242 | 515,647 | 500,700 |
| Store . . . | 15,148 | 59,745 | 43,988 | 42,074 | 51,329 | 69,320 | 46,520 |
| Total . . . | 443,251 | 603,162 | 503,584 | 500,051 | 456,571 | 584,967 | 547,220 |

TABLE NO. 8.—RETURN OF THE AVERAGE PRICES OF WOOL in the Four Years 1892-1895.

| Years. | Australian. | South African. | English Fleeces. | | | |
|----------------|-------------|----------------|------------------|-----------|-------|-------|
| | Per lb. | Per lb. | Per lb. | | | |
| | s. d. | s. d. | s. d. | s. d. | s. d. | s. d. |
| 1892 | 0 9 | 0 9½ | 0 8½ | 1 2 | | |
| 1893 | 0 8½ | 0 9½ | 0 8½ | 1 1½ | | |
| | | | Leicesters. | Lincolns. | | |
| | | | d. d. | s. d. | | |
| 1894 | 0 8½ | 0 9½ | 9 to 10 | 0 10½ | | |
| 1895 | 0 9 | 0 9½ | 9½ to 10½ | 1 0 | | |

GENERAL SHOW AT DUMFRIES, 1895.

THE Society paid its eighth visit to Dumfries in 1895. It was the sixty-eighth Show of the Society, and was held on the 23d July and three following days on the farm of Terreglestown, near Maxwelltown railway station. The field, extending to about 25 acres, made a fairly suitable site, farther from the town of Dumfries than could have been desired.

On the first two days of the Show the weather was favourable. On the Thursday it was bad, on the Friday it was about the worst ever experienced in a Highland Showyard. From midnight on Thursday till well on through the afternoon of Friday the downpour of rain was almost continuous and excessively heavy. It was found in the meteorological observations, taken at Cargen by Mr R. F. Dudgeon, that on the last two days of the Show the rainfall reached 2.88 inches, and on the closing day alone no less than 1.76 inch. Mr Dudgeon states that the rainfall of the Friday had been exceeded only on six previous occasions since the commencement of the observations at Cargen in 1860, the heaviest fall in twenty-four consecutive hours having been 2.1 inches on 29th May 1865.

The effect of such a deluge of rain upon the Show may easily be imagined. The closing day was practically a blank, and will not soon be forgotten by those who had the misfortune to spend any part of it in the Showyard. The parades of live stock had to be abandoned, and it was surprising that on such a day even as much as £237 was drawn at the entrance-gates.

In view of the extremely unfavourable character of the weather the attendance of the public was wonderfully large. The financial results were more satisfactory than had been generally expected, thanks in a great measure to the very handsome manner in which the counties of Dumfries, Kirkcudbright, and Wigtown and the town of Dumfries contributed to the local fund.

The display of live stock, taking it all over, was highly creditable, perhaps above the average of recent years.

It is not out of place here to direct attention to the very interesting paper which begins this volume. In his "Reminiscences of Eight Highland Shows at Dumfries" Mr W. H. Maxwell of Munches produces a fascinating picture of bygone days. How rarely it happens that one is able to speak as an eyewitness of so many public events, and covering such a long period of time as sixty-five years!

Statistics.

The following tables show the number of entries in the various sections :—

CATTLE.

| | Bulls. | Cows. | Heifers. | Oxen and Heifers. | Total. |
|--------------------------|--------|-------|----------|-------------------|--------|
| Shorthorn | 26 | 6 | 19 | ... | 51 |
| Aberdeen-Angus | 20 | 18 | 35 | ... | 73 |
| Galloway | 16 | 12 | 27 | ... | 55 |
| Highland | 16 | 6 | 5 | ... | 27 |
| Ayrshire | 13 | 28 | 20 | 2 | 63 |
| | 91 | 70 | 106 | 2 | 269 |

HORSES.

| | Stallions. | Entire Colts. | Mares. | Fillies. | Geldings. | Total. |
|--|------------|---------------|--------|----------|-----------|--------|
| For agricultural purposes | 16 | 57 | 27 | 59 | 22 | 181 |
| Hunters and roadsters | 1 | ... | 30 | ... | 37 | 68 |
| Yearlings, the produce of the } Queen's premium stallions | ... | 3 | ... | 5 | 3 | 11 |
| Hackneys | 4 | 9 | 6 | 14 | ... | 33 |
| Ponies | 5 | ... | 19 | ... | 9 | 33 |
| Shetland ponies | 3 | ... | 4 | ... | ... | 7 |
| Jumping | ... | ... | ... | ... | ... | 53 |
| | 29 | 69 | 86 | 78 | 71 | 386 |

SHEEP.

| | Tups. | Ewes. | Gimmers. | Wethers and Fat Lambs. | Total. |
|----------------------------|-------|-------|----------|------------------------|--------|
| Blackfaced | 49 | 5 | 7 | ... | 61 |
| Cheviot | 35 | 6 | 8 | ... | 49 |
| Border Leicester | 47 | 6 | 11 | ... | 64 |
| Shropshire | 14 | 3 | 4 | ... | 21 |
| Half-bred | 13 | ... | 1 | ... | 14 |
| Extra sections | ... | ... | ... | 16 | 16 |
| Extra sheep | 1 | ... | ... | ... | 1 |
| | 158 | 20 | 31 | 16 | 226 |

SWINE.¹

| | Boars. | Sows. | Pigs. | Total. |
|---|--------|-------|-------|--------|
| Large white breed | 4 | 7 | 4 | 15 |
| White breed, other than large | 3 | 4 | 4 | 11 |
| | 7 | 11 | 8 | 26 |

| | |
|----------------------------------|----------|
| | Entries. |
| POULTRY | 245 |
| DAIRY PRODUCE— | |
| Butter | 49 |
| Cheese | 65 |
| | 114 |
| HORSE-SHOING | 37 |
| IMPLEMENTS 170 stands) | 2266 |

The following table gives a comparative view of the display of cattle, horses, sheep, swine, poultry, dairy produce, and implements, of the value of the premiums offered, and of the receipts at the entrance-gates, grand stands, and for catalogues at the Shows which have been held at Dumfries:—

| Year. | Cattle. | Horses. | Sheep. | Swine. | Poultry. | Dairy Produce. | Horse-shoeing. | Implements. | Premiums. | Receipts. |
|----------------|---------|---------|--------|-----------------|----------|----------------|----------------|-------------|-----------|-----------|
| 1830 | 130 | 62 | 247 | 19 | ... | ... | ... | 18 | £353 | £163 |
| 1837 | 131 | 77 | 512 | 15 | ... | 31 | ... | 36 | 650 | 382 |
| 1845 | 297 | 75 | 537 | 62 | 101 | 88 | ... | 143 | 900 | 440 |
| 1860 | 298 | 166 | 558 | 54 | 216 | 195 | ... | 911 | 1500 | 1275 |
| 1870 | 374 | 171 | 817 | 76 | 402 | 130 | ... | 1873 | 1600 | 1897 |
| 1878 | 357 | 328 | 621 | 39 | 303 | 235 | ... | 2578 | 2703 | 3308 |
| 1886 | 287 | 312 | 505 | 32 | 144 | 146 | ... | 1639 | 2583 | 2814 |
| 1895 | 269 | 333 | 416 | 26 ¹ | 245 | 114 | 37 | 2265 | 2456 | 2600 |

Cattle.

The show of cattle, although not the largest at Dumfries, was of a high character. The breeds finding a place in the prize-list were all well represented. Fifty-one entries of Shorthorns may seem a small display for the cosmopolitan "red, white, and roan," but in merit at any rate there was no deficiency. The class of aged bulls was unusually strong, and was headed by a very fine specimen of the breed. This was Lord Polwarth's

¹ Not exhibited on account of the prevalence of swine-fever.

"Nonsuch" (65,969), which was the leading winner at the Royal English Show at Darlington, and which here won the Tweeddale medal for the best Shorthorn bull and the President's medal for the best Shorthorn in the yard. The two-year-old and yearling bull classes also showed high merit. The female classes of Shorthorns were strong in quality and character. Mr A. W. Law's two-year-old heifer "Graceful 3d," which won the Shorthorn Society's prize for the best female of the breed, was very highly thought of. She won in excellent company, after a keen contest.

It is much to the credit of the Aberdeen-Angus breed that, despite the great distance of the Show from their headquarters, the northern polls should have formed the largest display in the cattle section. The classes of bulls were comparatively small, but in quality and character the good name of the breed was well maintained. Sir George Macpherson Grant's famous stud bull "Prince Inca" (7844), winner of the first prize at Inverness in 1892, was shown as "Extra Stock." Fresh and handsome as ever in his seventh year, this valuable bull was awarded the President's medal for the best animal of the breed in the Showyard. Mr G. S. Grant's "Equestrian" (9953), which won the first prize in the old bull class and the Ballindalloch Challenge Cup for the best bull of the breed in the ordinary classes, is another very handsome bull, also bred at Ballindalloch, and got by the celebrated sire "Iliad" (2843). It is noteworthy that the second and third prize aged bulls were likewise sired by "Iliad" (2843). The female Aberdeen-Angus classes were exceptionally strong, and all through there was very keen competition. Mr Thomas Smith's cow "Witch of Endor 15th" (18,522), which won the Ballindalloch Challenge Cup for the best female of the breed, is a very attractive cow of choice quality. The heifer classes of this breed made very fine displays in the judging ring.

A strong muster of Galloway cattle was looked for, and it was there. The classes were fairly well filled in regard to numbers, and the standard of merit was very high. In an excellent class of aged bulls Mr R. F. Dudgeon won the first prize with his handsome bull "Crown Jewel 2d of Tarbreoch" (5303), which also won the special prize for the best bull of the breed. The younger bull classes were also creditably filled. Cows made a strong class, and still stronger were the classes of Galloway heifers. Mr John Cunningham's two-year-old heifer "Dora of Durhamhill" (13,550), which won the special prize for the best Galloway female and the President's medal for the best animal of the breed, is an animal of quite exceptional merit.

There was a small but representative collection of Highland

cattle. In all the classes there were animals of high merit. Notable features were the great success of Mr Valentine Smith's herd, and of stock got by the famous Ensay sire "Ceatharnach" (642).

The famous dairy breed of Scotland was of course well represented. Most of the classes were large, and the competition unusually keen. Mr R. M. Reid won the champion prize for bull with "Royal Kyle," a very handsome three-year-old, bred by Mr R. Montgomerie and got by "Craigs o' Kyle" (1793). The Ayrshire cow classes were exceptionally strong, Mr James Lawrie having much credit by the achievement of his grand cow "Beauty" (7087), which won not only the Challenge Cup for the best Ayrshire female, but also the President's medal for the best animal of the breed in the Show. "Beauty" was bred by Mr Lawrie and got by "Avon King" (2992).

Horses.

As would be expected, Clydesdale horses made a fine display. The entries were fairly numerous, and in regard to merit the great draught breed of the south-west of Scotland was very creditably represented. Aged Clydesdale stallions were good as a whole, and the same may be said of the three-year-old stallions, the leading winners in both classes being of outstanding merit. There were strong classes of two-year-old and yearling Clydesdale colts. The Marquis of Londonderry's champion stallion "Holyrood" (9546) is a well-built useful brown, bred by his lordship, and got by "Gallant Prince" out of the Darnley mare "Jeanie Darnley" (8668).

Strong as were the classes of Clydesdale stallions and colts, there was still a better display of Clydesdale mares and fillies. Brood mares were an excellent lot; and rarely does one see a stronger class than was that of dry Clydesdale mares. Mr Gilmour's famous "Moss Rose" (6203) once again appeared in astonishingly fresh condition; and strong as was the competition, she was a popular winner of the highest honours available, the Cawdor Challenge Cup and the President's medal for the best female Clydesdale in the Show. The other leading winners in the Clydesdale female classes were all animals of unquestionably high merit.

An excellent feature of the Show was the capital display of draught geldings. The turn-out of hunting horses was better than usual. Roadsters were very good, and there was a highly creditable and encouraging display of hackney horses. The class of yearlings got by thoroughbred stallions made a fairly good appearance. Most of the pony classes were well filled, but the collection of Shetland ponies was very small.

The driving competitions as usual excited a good deal of interest, and again the jumping contests were highly successful and popular.

Sheep, &c.

The sheep section was, on the whole, perhaps the strongest in the Show. The muster of the Blackfaced breed was remarkably good. Border Leicester and Cheviot sheep were almost equally meritorious. Shropshires and Half-breds were few in number, but of high merit.

It was unfortunate that for the second year in succession swine had, on account of the prevalence of swine-fever, to be excluded from the Show. There was a large display of butter and cheese, and of both the quality reached a high standard. The show of poultry was fairly good.

The display in the implement department of the Show was very large and interesting. Unfortunately the success of this department was greatly marred by the inclemency of the weather.

An especially interesting feature of the Show were the horse-shoeing competitions. These took place on the last two days of the Show, and in spite of the bad weather they attracted much attention.

MACHINERY TRIALS.

In connection with the Dumfries Show the Society held an Exhibition of Binders at work, and a competitive trial of Turnip-Lifters.

Exhibition of Binders at Work.

The exhibition of combined reapers and binders at work took place at Mr Howat's farm of Netherwood, near Dumfries, on Tuesday, 20th August. The weather was very unsettled for some time before, but fortunately on the day of the trial it was delightfully fine.

The field, which was kindly granted for the trial by Mr Howat, was admirably suited for the purpose. The oat crop, occupying the whole field, was heavy, and in many parts badly laid and twisted. The machines were thus well tested both in lying and standing corn.

The attendance of farmers was fairly large, yet not quite so large as might have been expected. The arrangements were in charge of the following directors and officials of the Society—viz., Mr W. H. Maxwell of Munches, Convener of the Local Committee, Mr Maxwell, yr. of Munches, Mr R. F. Dudgeon of Cargen, Rev. John Gillespie, Mr D. Kirkpatrick, Amisfield,

Mr Wallace, Terreglestown, Mr J. D. Park, the Society's Engineer, and Mr James Macdonald, Secretary.

Of the nine machines entered the following eight took part in the trial, viz. :—

- Harrison, Mc'Gregor, & Co. (Limited), Leigh, Lancashire—The "Albion," with transport arrangement.
 Richard Hornsby & Sons (Limited), Grantham—Sheaf-Binding Harvester, with transport arrangement.
 A. & J. Main & Co., Edinburgh—Low-Down Open-End Deering Pony Harvester and Binder.
 Milne & Macdonald, Lockerbie—"Adriance" Rear Discharge Binder, without canvas elevator.
 Samuelson & Co. (Limited), Banbury, Oxon—Low-Down Sheaf-Binding Harvester, without elevating aprons.
 John Wallace & Sons, Graham Square, Glasgow—Massey-Harris Open-End Elevating Canvas Binder, with transport arrangement.
 Walter A. Wood, M. & R. M. Co., 36 Worship Street, London, E.C.—Open Rear Harvester and Binder.
 J. & R. Wallace, Foundry, Castle-Douglas—Binder, with new chain conveyor and elevator.

As already indicated, the machines were tried only in oats; yet with a heavy crop, partly laid and partly standing, the test was exceptionally severe. In compliance with the representations submitted by the makers in 1894, it was again decided not to make tests of the speed or draught of the machines, the farmers present being allowed to form their own judgment as to the character of the work done. It is gratifying to be able to say that upon the whole the work was executed in a highly satisfactory manner. Indeed the performance of several of the machines on the badly laid crop was so nearly perfect as to excite the highest admiration amongst the visitors.

In the forenoon the machines were employed in cutting separate plots which had been prepared in one half of the field. In the afternoon the machines followed each other in cutting the remainder of the field. The farmers present had thus excellent opportunities of witnessing the working of the various machines, and from beginning to end they watched the proceedings with the keenest interest.

Trial of Turnip-Lifters.

The trial of turnip-lifters was held on Wednesday, 13th November, on fields kindly granted for the occasion at the Crichton Royal Institution, Dumfries. The weather was unfavourable, and there was a small attendance of farmers.

The arrangements were in charge of the Stewards of Implements, Messrs Jonathan Middleton and George R. Glendinning, and the Secretary of the Society. Mr W. H. Maxwell of

Munches, Convener of the Local Committee, Mr Maxwell, yr. of Munches, Mr R. F. Dudgeon of Cargen, and the Rev. John Gillespie, represented the Board of Directors.

The entries were as follows, viz. :—

William Duncan, blacksmith, Deskford, Cullen.

1. Excelsior Turnip-Lifter—Price, £4, 17s. 6d.

John Fairweather, Chapelton, Brechin.

2. Turnip Topping and Tailing Machine, made by Moir & Dargie, Foundry, Brechin—Price £12.

Thomas Hunter & Sons, Implement Works, Maybole.

3. Single-Drill Turnip Topping and Tailing Machine—Price £4, 10s.

4. Double-Drill Turnip Topping and Tailing Machine—Price £9.

John Macdonald, blacksmith, Aberlour.

5. Turnip-Lifter, drawn by one horse, moves on slides without wheels—Price £5.

Macdonald Brothers, Portsoy.

6. Turnip-Lifter, also for scarifying turnip drills before hoeing—Price £5; scarifier arrangement 15s. extra.

John Wallace & Sons, Graham Square, Glasgow.

7. Patent Turnip Topping and Tailing Machine—Price, £10, 10s.

The Judges—Messrs James Biggar, Grange Farm, Dalbeattie; David Kirkpatrick, Amisfield, Townfoot; W. T. Sproat, Borgue House, Kirkcudbright; James D. Park, Edinburgh—awarded the prizes as follows :—

First Prize (£10).—No. 6. Macdonald Brothers, Portsoy.

Second Prize (£5).—No. 5. John Macdonald, Aberlour.

The working of the various machines is described in the following

Report by the Judges.

“Seven machines were entered for competition, but one was withdrawn early in the trial; of the remaining six, five were single-drill and one was a double-drill machine.

“The machines were first tried on a plot of swedes, eight drills being allotted to each.

“The crop was a fairly uniform one of about 25 tons per acre, and the land was fairly free from stones and suitable for the trial.

“All the machines worked satisfactorily. The topping in nearly every case was well done, the tops being cut off about an inch from the bulb, and the bulbs uninjured by the knives.

“The tailing was also fairly well done, but none of the machines made as clean work as hand-tailing.

“Most of the machines seemed to adapt themselves to the unequal heights of the turnips remarkably well, and very few tops were missed; the tailing-knives seemed easy of adjustment, and could be made to work deeper or closer to the bulbs at will.

“The turnips were left standing in rows as they were grown,

but it is a question whether they would not have been better turned out so that any adhering earth could dry more readily and fall off in lifting. The machines were also tried on a plot of yellow turnips, but the conditions were unfavourable. The tops were rank, wet, and broken down, and the land soft and mossy. The roots did not seem to have sufficient hold, and none of the machines did satisfactory work.

"The judges were unanimous in awarding the first prize to No. 6 machine and the second to No. 5.

"The first-prize machine is mounted on four wheels, is light of draft, easily managed, and did excellent work.

"The second-prize machine works on slides, is simple and efficient.

"The other machines were similar to No. 5, except No. 7, which had rotary knives for cutting off the tops. It was expected that this would be more successful than the others in the yellow turnips, but little difference was noticeable."

PREMIUMS AWARDED BY THE SOCIETY IN 1895

I.—DUMFRIES SHOW

23d, 24th, 25th, and 26th July 1895

ABBREVIATIONS.—V.H.C., *Very Highly Commended*. H.C., *Highly Commended*. C., *Commended*.

CATTLE

SHORTHORN.

PRESIDENT'S MEDAL for best Shorthorn.

The Right Hon. Lord Polwarth, Mertoun House, St Boswells, N.B., "Nonsuch" (65,969).

THE TWEEDDALE GOLD MEDAL, value £20, for best Shorthorn Bull.

The Right Hon. Lord Polwarth, Mertoun House, St Boswells, N.B., "Nonsuch" (65,969).

Breeder of best Bull of any age in Classes 1, 2, and 3—Silver Medal.

J. Hill, Langside, Fife.

CLASS 1. BULL, calved before 1st January 1893.—Premiums, £15, £10, and £5.

1st. The Right Hon. Lord Polwarth, Mertoun House, St Boswells, N.B., "Nonsuch" (65,969).

2d. John Gordon Smith, Minmore, Glenlivet, "Faugh-a-Ballagh" (64,013).

3d. George Harrison, Underpark, Lealholm, Grosmont, Yorks, "Royal Ury" (63,302).

V.H.C. The Earl of Rosebery, Dalmeny Park, Edinburgh, "Sittyton Seal" (64,866).

H.C. Lord Brougham and Vaux, Brougham, Penrith, "Maximus" (64,417).

CLASS 2. BULL, calved in 1893.—Premiums, £15, £10, and £5.

1st. George Harrison, Underpark, Lealholm, Grosmont, Yorks, "Champion Cup" (65,240).

2d. The Earl of Caledon, Caledon, Caledon Co., Tyrone, "Sign of Riches" (66,324).

3d. The Earl of Rosebery, Dalmeny Park, Edinburgh, "Lord Provost" (65,846).

V.H.C. John Handley, Greenhead, Milnthorpe, "Duke of York" (65,400).

H.C. John Gilmour of Lundin and Montrave, Leven, "Braw Duke" (65,169).

C. The Earl of Rosebery, Dalmeny Park, Edinburgh, "Dictator" (65,338).

CLASS 3. BULL, calved in 1894.—Premiums, £12, £8, and £4.

1st. J. Douglas Fletcher of Rosehaugh, Avoch, R.S.O., "Watchword."

2d. John Gilmour of Lundin and Montrave, Leven, "Bridegroom."

3d. John Handley, Green Head, Milnthorpe, "British Chief."

V.H.C. George Harrison, Underpark, Lealholm, Grosmont, Yorks, "Wiltshire Count."

H.C. John Handley, Green Head, Milnthorpe, "Sir Arthur Teesdale."

C. Joseph Harris, Calthwaite Hall, Carlisle, "Oxford Duke of Calthwaite 29th."

Best Female of any age in Classes 4, 5, and 6—£20, given by the Shorthorn Society.
Arthur W. Law, Mains of Sanquhar, Forres, "Graceful 8d."

CLASS 4. COW, of any age.—Premiums, £12, £8, and £4.

1st. The Right Hon. Lord Polwarth, Mertoun House, St Boswells, N.B., "Heroine."

2d. The Earl of Rosebery, Dalmeny Park, Edinburgh, "Fragrant Blossom."

3d. William T. Malcolm, Dunmore Home Farm, by Larbert, "Raindrop."

H.C. J. Douglas Fletcher of Rosehaugh, Avoch, R.S.O., "Sunbeam 2d."

C. Edward Ecroyd, Lowhouse, Armathwaite, R.S.O., Carlisle, "Armathwaite Rose."

CLASS 5. HEIFER, calved in 1893.—Premiums, £10, £5, and £3.

1st. Arthur W. Law, Mains of Sanquhar, Forres, "Graceful 8d."

2d. John Hill, Langside, Kennoway, "Pearl."

3d. George Harrison, Underpark, Lealholm, Grosmont, Yorks, "Gratia."

V.H.C. Edward Ecroyd, Lowhouse, Armathwaite, R.S.O., Carlisle, "Eden Millicent 11th."

H.C. George Harrison, Underpark, Lealholm, Grosmont, Yorks, "Blanche."

C. The Right Hon. Lord Polwarth, Mertoun House, St Boswells, N.B., "Queen Cake."

CLASS 6. HEIFER, calved in 1894.—Premiums, £10, £5, and £3.

1st. Arthur W. Law, Mains of Sanquhar, Forres, "Aggie Grace."

2d. George Harrison, Underpark, Lealholm, Grosmont, Yorks, "Rose Blossom."

3d. The Earl of Rosebery, Dalmeny Park, Edinburgh, "Veronica 2d."

H.C. The Right Hon. Lord Polwarth, Mertoun House, St Boswells, N.B., "Princess Mary."

C. Thomas Lambert, Elrington Hall, Hexham, "Studleys Rosedale."

ABERDEEN-ANGUS.

PRESIDENT'S MEDAL for best Aberdeen-Angus Animal.

Sir George Macpherson Grant, Bart., The Castle, Ballindalloch, Bull, "Prince Inca" (7844).

Best Bull of any age in Classes 7, 8, and 9—Ballindalloch Challenge Cup, value £50, given by the late Mr Macpherson Grant of Drumduan. The Cup shall be held by the winner for one year, and shall become the property of the Exhibitor who shall win it five times, not necessarily in succession.

George Smith Grant, Auchorachan, Glenlivet, Ballindalloch, "Equestrian" (9953).

Breeder of best Bull of any age in Classes 7, 8, and 9—Silver Medal.

Sir George Macpherson Grant, Bart., The Castle, Ballindalloch.

Breeder of the Winner of the Ballindalloch Cup—Silver Medal.

Sir George Macpherson Grant, Bart., The Castle, Ballindalloch.

CLASS 7. BULL, calved before 1st December 1892.—
Premiums, £15, £10, and £5.

1st. George Smith Grant, Auchorachan, Glenlivet, Ballindalloch, "Equestrian" (9953).

2d. Miss Morison Duncan, Naughton, Dundee, "Edric" (9110).

3d. Sir George Macpherson Grant, Bart., The Castle, Ballindalloch, "Eurotas of Ballindalloch" (9962).

H.C. Colonel Stirling of Kippendavie, Kippenross, Dunblane, "Baron Blackbird" (9787).

CLASS 8. BULL, calved on or after 1st December 1892.—
Premiums, £15, £10, and £5.

- 1st. John William Earle, Kirkbridge, Aldbrough, Darlington, "Fairy King of Kirkbridge" (11,862).
- 2d. The Countess Dowager of Seafield, Home Farm, Cullen House, Cullen, "Bernadotte" (10,648).
- 3d. Trustees of the late Captain Edward Fraser of Williamston, Inch, Aberdeenshire, "Mayor of Auchorachan" (11,071).
- H.C. Sir Thomas D. Gibson-Carmichael, Bart., of Skirling, Castlecraig, Dolphinton, "Egerton" (10,796).
- C. Thomas Smith, Powrie, Dundee, "Monarch 8th of Powrie" (11,093).

CLASS 9. BULL, calved on or after 1st December 1893.—
Premiums, £12, £8, and £4.

- 1st. John Gordon Smith, Minmore, Glenlivet, "Bion" (11,454).
- 2d. The Right Hon. the Earl of Strathmore, Glamis Castle, Glamis, "Appraiser of Glamis" (11,422).
- 3d. C. Bolden, Preston Bisset, Buckingham, "Eglamore" (11,618).
- H.C. Colonel Stirling of Kippendavie, Kippenross, Dunblane, "Prince Zenophen of Kippendavie" (12,020).
- C. Thomas Smith, Powrie, Dundee, "Wilfred 18th" (12,208).

Best Cow of any age in Classes 10 and 11—Ballindalloch Challenge Cup, value £50, given by the late Mr Macpherson Grant of Drumduan. The Cup shall be held by the winner for one year, and shall become the property of the Exhibitor who shall win it five times, not necessarily in succession.

Thomas Smith, Powrie, Dundee, "Witch of Endor 15th" (18,522).

Breeder of best Cow of any age in Classes 10 and 11, winner of Ballindalloch Cup
—Silver Medal.

Thomas Smith, Powrie, Dundee.

CLASS 10. COW, calved before 1st December 1891.—Premiums, £12, £8, and £4.

- 1st. Thomas Smith, Powrie, Dundee, "Witch of Endor 15th" (18,522).
- 2d. Sir George Macpherson Grant, Bart., The Castle, Ballindalloch, "Pride of Inverglas" (16,504).
- 3d. Miss Morison Duncan, Naughton, Dundee, "Elena of Naughton" (17,774).
- V.H.C. Robert Forbes, Woodhead, Kinloss, Forbes, "Queen 2d of Lynemore" (17,835).
- H.C. Sir Thomas D. Gibson-Carmichael, Bart., of Skirling, Castlecraig, Dolphinton, "Soda Water" (18,064).
- C. J. Douglas Fletcher of Rosehaugh, Avoch, R.S.O., "Pride of Fortrose" (17,823).
- C. Thomas Smith, Powrie, Dundee, "Witch of Endor 11th" (15,642).

CLASS 11. COW, calved on or after 1st December 1891.—Premiums, £12, £8, and £4, given by the late Mr Macpherson Grant of Drumduan.

- 1st. Sir George Macpherson Grant, Bart., The Castle, Ballindalloch, "Gerenda" (19,259).
- 2d. Her Majesty the Queen, Abergeldie Mains, Ballater, "Gentian" (19,258).
- 3d. Thomas Smith, Powrie, Dundee, "Witch of Endor 21st" (19,829).
- V.H.C. George Willsher, Pitpointie, Dundee, "Flower Girl of Pitpointie" (20,032).
- H.C. Major M. H. Lambert, Widdrington, Acklington, Northumberland, "Lady Barry" (19,205).
- C. Sir Robert Moncreiffe, Bart., Gateside Home Farm, Bridge of Earn, N.B., "Princess 3d of Balgersho" (17,807).
- C. Thomas Smith, Powrie, Dundee, "Pride of Powrie 5th" (19,819).

CLASS 12. HEIFER, calved on or after 1st December 1892.—
Premiums, £10, £5, and £3.

- 1st. George Willsher, Pitpointie, Dundee, "Blooming Rose" (21,278).
- 2d. Marquis of Huntly, Aboyne Castle, Aboyne, "St Barbara" (20,651).

- 3d. The Countess Dowager of Seafield, Home Farm, Cullen House, Cullen, "Cullen Kate" (21,000).
 V.H.C. Sir George Macpherson Grant, Bart., The Castle, Ballindalloch, "Eblana" (20,553).
 V.H.C. Sir George Macpherson Grant, Bart., The Castle, Ballindalloch, "Errant Echo" (20,560).
 H.C. Sir Thomas D. Gibson-Carmichael, Bart., of Skirling, Castlecraig, Dolphinton, "Pride of Kirkurd" (20,522).
 H.C. Major M. H. Lambert, Widdrington, Acklington, Northumberland, "Pride of Burnshange 2d" (21,048).
 C. Her Majesty the Queen, Abergeldie Mains, Ballater, "Fredoreca 3d" (21,338).
 C. The Right Hon. The Earl of Strathmore, Glamis Castle, Glamis, "Melody of Glamis" (21,145).

CLASS 13. HEIFER, calved on or after 1st December 1893.—
 Premiums, £10, £5, and £3.

- 1st. The Right Hon. The Earl of Strathmore, Glamis Castle, Glamis, "Minx of Glamis" (22,408).
 2d. Sir George Macpherson Grant, Bart., The Castle, Ballindalloch, "Mantlet" (21,825).
 3d. Marquis of Huntly, Aboyne Castle, Aboyne, "Waitress of Aboyne."
 V.H.C. The Right Hon. The Earl of Strathmore, Glamis Castle, Glamis, "Rivena of Glamis" (22,410).
 H.C. J. Douglas Fletcher of Rosehaugh, Avoch, R.S.O., "Miss Flighty" (21,712).
 C. Sir Thomas D. Gibson-Carmichael, Bart., of Skirling, Castlecraig, Dolphinton, "Pride of Skirling" (21,762).
 C. The Countess Dowager of Seafield, Home Farm, Cullen House, Cullen, "Ada Flush" (22,241).
 C. Miss Morison Duncan, Naughton, Dundee, "Erica Fairy" (21,648).

EXTRA STOCK.

- V.H.C. Sir George Macpherson Grant, Bart., The Castle, Ballindalloch, Bull, "Prince Inca" (7844).

GALLOWAY.

PRESIDENT'S MEDAL for best Galloway.

- John Cunningham, Durhamhill, Dalbeattie, "Dora of Durhamhill" (13,550).

*Best Bull in Classes 14, 15, and 16—Cup, value £10, 10s., given by
 the Galloway Cattle Society.*

- Robert Francis Dudgeon, Cargen, Dumfries, "Crown Jewel 2d of Tarbreoch" (5303).

Breeder of best Bull of any age in Classes 14, 15, and 16—Silver Medal.

- James Cunningham, Tarbreoch, Dalbeattie.

CLASS 14. BULL, calved before 1st January 1893.—Premiums, £15, £10, and £5.

- 1st. Robert Francis Dudgeon, Cargen, Dumfries, "Crown Jewel 2d of Tarbreoch" (5303).
 2d. H. G. Murray Stewart of Cally, Gatehouse, N.B., "The Pathfinder 2d" (5838).
 3d. Sir Robert Jardine, Bart., of Castlemilk, Lockerbie, "Black Douglas of Castlemilk" (5002).
 H.C. William Parkin-Moore, Whitehall, Mealsgate, Carlisle, "Indian Prince 2d of Drumlanrig" (5260).
 C. Thomas Lennox, Newmilns, Wigtown, N.B., "Duke of York" (6880).

CLASS 15. BULL, calved in 1893.—Premiums, £15, £10, and £5.

- 1st. Wilson Brothers, Cumstone, Lockerbie, "Sir Duncan" (5903).
 2d. Christopher Graham, Skipmyre, Lochmaben, "Glenlivet" (6210).
 3d. Sir Robert Jardine, Bart., of Lanrick, Doune, "Lowlander 2d of Tarbreoch" (5992).
 H.C. Christopher Graham, Harelawhill, Canonbie, "The Pathfinder 3d" (5991).
 C. J. & S. Nivison, Lairdlaugh, Dalbeattie, "Macduff" (5905).

CLASS 16. BULL, calved in 1894.—Premiums, £12, £8, and £4.

- 1st. William Parkin-Moore, Whitehall, Mealsgate, Carlisle, "Nonpareil of Castlemilk" (6163).
 2d. Thomas Biggar & Sons, Grange Farm, Dalbeattie, "Land Surveyor" (6156).
 3d. William Barbour, Troquhain, New Galloway, "Snowball" (6204).
 C. James Henderson, Ryemur, Lochmaben, "Camp Follower 2d" (6172).

Best Female in Classes 17, 18, and 19—Cup, value £10, 10s., given by the Galloway Cattle Society.

John Cunningham, Durhamhill, Dalbeattie, "Dora of Durhamhill" (13,550).

CLASS 17. COW, of any age.—Premiums, £12, £8, and £4.

- 1st. Sir Robert Jardine, Bart., of Castlemilk, Lockerbie, "Maggie 4th of Tarbreoch" (11,993).
 2d. William Parkin-Moore, Whitehall, Mealsgate, Carlisle, "Tidy Lady of Mer-toun" (13,474).
 3d. Sir Robert Jardine, Bart., of Castlemilk, Lockerbie, "Lady Vaudeville of Castlemilk" (12,936).
 V.H.C. H. G. Murray Stewart, Cally, Gatehouse, N.B., "Maggie 3d of Cally" (12,758).
 H.C. Leonard Pilkington, Cavens, Dumfries, "Annie Laurie 3d of Cavens" (13,113).
 C. H. G. Murray Stewart, Cally, Gatehouse, N.B., "Maggie of Cally" (late 9729) (11,899).

CLASS 18. HEIFER, calved in 1893.—Premiums, £10, £5, and £3.

- 1st. John Cunningham, Durhamhill, Dalbeattie, "Dora of Durhamhill" (13,550).
 2d. His Grace The Duke of Buccleuch and Queensberry, K.T., Drumlanrig Castle, Thornhill, "Pride 7th of Drumlanrig" (13,407).
 3d. His Grace The Duke of Buccleuch and Queensberry, K.T., Drumlanrig Castle, Thornhill, "Atalanta 5th of Drumlanrig" (13,405).
 V.H.C. H. G. Murray Stewart, Cally, Gatehouse, N.B., "Maggie 5th of Cally" (13,779).
 H.C. Countess of Carlisle, Naworth Castle, Brampton, Cumberland, "Snowdrop of Naworth" (13,441).
 C. H. G. Murray Stewart, Cally, Gatehouse, N.B., "Annie 3d of Cally" (13,785).

CLASS 19. HEIFER, calved in 1894.—Premiums, £10, £5, and £3.

- 1st. John Cunningham, Durhamhill, Dalbeattie, "Maggie Lauder of Durhamhill" (13,994).
 2d. Sir Robert Jardine, Bart., of Castlemilk, Lockerbie, "Lady Isabell Douglas 5th of Castlemilk" (13,864).
 3d. William Parkin-Moore, Whitehall, Mealsgate, Carlisle, "Mac's Tidy of Whitehall" (14,026).
 V.H.C. Sir Robert Jardine, Bart., of Castlemilk, Lockerbie, "Miss Tidy 2d of Castlemilk" (13,873).
 H.C. Thomas Biggar & Sons, Chapelton, Dalbeattie, "Caprice 11th" (14,000).
 C. James Cunningham, Tarbreoch, Dalbeattie, "Maggie 8th of Tarbreoch" (13,927).

HIGHLAND.

PRESIDENT'S MEDAL for best Highland Animal.

Thomas Valentine Smith, Ardtornish, Morvern, Argyllshire, "Valentine 11th" (1160).

Breeder of best Bull of any age in Classes 20, 21, and 22—Silver Medal.

Thomas Valentine Smith, Ardtornish, Morvern, Argyllshire, "Valentine 11th" (1160).

CLASS 20. BULL, calved before 1st January 1893.—

Premiums, £15, £10, and £5.

- 1st. Thomas Valentine Smith, Ardtornish, Morvern, Argyllshire, "Valentine 6th" (1064).
 2d. Sir John Campbell Orde, Bart., Kilmory, Lochgilphead, "Blair Athole" (979).
 3d. John Stewart, Ensay, Obbe, Harris, "An-t-Oganach" (1084).
 V.H.C. The Duke of Atholl, K.T., Blair Castle Blair Atholl, "Adhollach" (960).

CLASS 21. BULL, calved in 1893.—Premiums, £15, £10, and £5.

- 1st. Thomas Valentine Smith, Ardtornish, Morvern, Argyllshire, "Valentine 11th" (1160).
- 2d. John Stewart, Ensay, Obbe, Harris, "An Gille Glic" (1079).
- 3d. John Stewart, Bochastle, Callander, "Dhaibhuidh Bhuidhe."
- V.H.C. Sir J. Campbell Orde, Bart., Kilmory, Lochgilphead, "Gaidheal Ahollach."

CLASS 22. BULL, calved in 1894.—Premiums, £12, £8, and £4.

- 1st. Colonel Malcolm, C.B., of Poltalloch, Poltalloch, Lochgilphead, "Balach-a-Ghlinne-So."
- 2d. Thomas Valentine Smith, Ardtornish, Morvern, Argyllshire, "Victor 13th."
- 3d. D. A. Stewart, Scorrybreck, Portree, "Dochfour."
- V.H.C. The Earl of Southesk, K.T., Kinnaird Castle, Brechin, "Boaz" (1089).
- H.C. Thomas Valentine Smith, Ardtornish, Morvern, Argyllshire, "Valentine 13th."
- C. J. Campbell of Kilberry, Argyllshire, "Cnocbuidhe" (1096).

CLASS 23. COW, of any age.—Premiums, £12, £8, and £4.

- 1st. John Stewart, Bochastle, Callander, "Mairi Bhuidhe of Bochastle" (2321).
- 2d. Thomas Valentine Smith, Ardtornish, Morvern, Argyllshire, "Phroiseag 4th of Ardtornish" (2275).
- 3d. J. Campbell of Kilberry, Argyllshire, "Baravalla Riabhach" (1401).
- V.H.C. The Duke of Atholl, K.T., Blair Castle, Blair Atholl, "Annag Riabhach 3d" (2547).

CLASS 24. HEIFER, calved in 1892.—Premiums, £10, £5, and £3.—*No Entry.*

CLASS 25. HEIFER, calved in 1893.—Premiums, £10, £5, and £3.

- 1st. John Stewart, Bochastle, Callander, "Anna Ruadh."
- 2d. Thomas Valentine Smith, Ardtornish, Morvern, Argyllshire, "Sgiathach 12th."
- 3d. M. & E. M'Rae, Mains of Kinbeachie, Conon Bridge, "Buidheag of Kinbeachie."
- V.H.C. Thomas Valentine Smith, Ardtornish, Morvern, Argyllshire, "Sgiathach 11th."

EXTRA STOCK.

- V.H.C. John Stewart, Bochastle, Callander, Cow, "Proisag Dubh 2d" (3011).

AYRSHIRE.

PRESIDENT'S MEDAL for best Ayrshire.

James Lawrie, West Newton, Strathaven, "Beauty" (7807).

Best Ayrshire Bull in Classes 26, 27, and 28, registered, or eligible to be registered, in the Ayrshire Herd-Book—Champion Cup, value £50, given by Ayrshire Cattle Herd-Book Society. The Cup to be won three times (not necessarily in succession) before becoming the property of the winner.

Robert M. Reid, Bonshaw, Stewarton, "Royal Kyle."

Breeder of best Bull of any age in Classes 26, 27, and 28—Silver Medal.

Robert Montgomerie, Lessnessock, Ochiltree.

CLASS 26. BULL, calved before 1st January 1893.—Premiums, £15, £10, and £5.

- 1st. Robert M. Reid, Bonshaw, Stewarton, "Royal Kyle."
- 2d. Thomas Barr, Monkland, Kilmarnock, "White Cockade" (2852).
- 3d. Leonard Pilkington, Caven, Dumfries, "Field Marshal."
- H.C. Robert Wardrop, Garlaff, Cumnock, "Blood for Ever" (2659).

CLASS 27. BULL, calved in 1893.—Premiums, £12, £8, and £4.

- 1st. Andrew Mitchell, Barcheskie, Kirkcudbright, "Son of a Gun."
- 2d. Robert Montgomerie, Lessnessock, Ochiltree, "Royal Macgregor."
- 3d. Sir Mark J. Stewart, Bart., M.P., Southwick, Dumfries, "First Choice" (3005).

CLASS 28. BULL, calved in 1894.—Premiums, £8, £5, and £3.

- 1st. Robert M'Kinlay, Hillhouse, Sandilands, Lanark, "Adjutant 2d."

- 2d. Robert Wardrop, Garlaff, Cumnock, "Cushernaa."
 3d. Robert Osborne, Wynholm, Lockerbie, "King David."
 V.H.C. Hugh Drummond, Craighead, Mauchline, "The Boss."
 H.C. Alex. Y. Allan, Croftjane, Thornhill.

Best Ayrshire Female in Classes 29, 30, 31, 32, and 33, registered, or eligible to be registered, in the Ayrshire Herd-Book—Champion Cup, value £50, given by Ayrshire Cattle Herd-Book Society. The Cup to be won three times (not necessarily in succession) before becoming the property of the winner.

James Lawrie, West Newton, Strathaven, "Beauty" (7807).

CLASS 29. COW (in Milk), any age.—Premiums, £10, £7, and £3.

- 1st. Alexander Cross, Knockdon, Maybole, "Soncy of Outmans" (8163).
 2d. Robert Wilson, Manswrae, Bridge of Weir, "Blackie."
 3d. Leonard Pilkington, Cavens, Dumfries, "Brownie."
 V.H.C. James Wilson, Boghall, Houston, "Trim 5th" (8799).
 H.C. Thomas Kerr, Kirkchrist, Kirkcudbright, "Lily 3d of Kirkchrist" (7647).
 C. Robert Wilson, Manswrae, Bridge of Weir, "Whitie."

CLASS 30. COW, in Milk, calved in 1892.—Prizes of £10, £7, and £3.

Given by Mr Alexander Cross of Knockdon.

- 1st. R. & J. M'Allister, Mid-Ascog, Rothesay, "Janet."
 2d. Sir Mark J. Stewart, Bart., M.P., Southwick, Dumfries, "Bertie 4th of Southwick" (8106).
 3d. Robert Wilson, Manswrae, Bridge of Weir, "Mayflower 5th."
 V.H.C. James R. W. Wallace, Auchenbrack, Thornhill, "Daisy 4th of Castlehill" (8818).

CLASS 31. COW, of any age, in Calf, or Heifer calved in 1892 in Calf and due to calve within one month of the first day of the Show.—Premiums, £10, £7, and £3.

- 1st. James Lawrie, West Newton, Strathaven, "Beauty" (7807).
 2d. Alexander Cross, Knockdon, Maybole, "Bright Lady" (6774).
 3d. James Lawrie, West Newton, Strathaven, "Bloomer."
 V.H.C. Leonard Pilkington, Cavens, Dumfries, "Mary of Cavens."
 H.C. Alexander Cross, Knockdon, Maybole, "Look-on of Knockdon" (6773).
 C. Thomas Kerr, Kirkchrist, Kirkcudbright, "Queen of Hillhouse" (7079).

CLASS 32. HEIFER, calved in 1893.—Premiums, £10, £5, and £3.

- 1st. William P. Gilmour, Balmangan, Borgue, Kirkcudbright.
 2d. Andrew Mitchell, Barcheskie, Kirkcudbright, "Cecilia."
 3d. Leonard Pilkington, Cavens, Dumfries, "Daisy Bell."
 V.H.C. Sir Mark J. Stewart, Bart., M.P., Southwick, Dumfries, "Rosebud of Southwick."
 H.C. Robert Wardrop, Garlaff, Cumnock, "Mayflower" (8666).
 C. Sir Mark J. Stewart, Bart., M.P., Southwick, Dumfries, "Princess 6th of Southwick."
 C. W. P. Gilmour, Balmangan, Borgue.
 C. Hugh Drummond, Craighead, Mauchline, "Lady Glasgow."

CLASS 33. HEIFER, calved in 1894.—Premiums, £8, £5, and £3.

- 1st. Sir Mark J. Stewart, Bart., M.P., Southwick, Dumfries, "Robeena of Southwick."
 2d. Hugh Drummond, Craighead, Mauchline, "May Queen 2d."
 3d. Sir Mark J. Stewart, Bart., M.P., Southwick, Dumfries, "Lady Grace."
 V.H.C. Robert Wardrop, Garlaff, Cumnock, "Nancy."
 H.C. Andrew Mitchell, Barcheskie, Kirkcudbright, "Bridesmaid 2d."
 C. R. Osborne, Wynholm, Lockerbie, "Nellie."

EXTRA CATTLE.

The following was Very Highly Commended :—

Sir J. C. Orde, Bart., Kilmory, Lochgilphead, Bullock (Cross).

The following was Commended :—

Sir J. C. Orde, Bart., Kilmory, Lochgilphead, Bullock (Cross).

HORSES

FOR AGRICULTURAL PURPOSES.

PRESIDENT'S MEDAL for best Clydesdale Stallion.

The Marquis of Londonderry, K.G., Seaham Hall, Seaham Harbour, "Holyrood" (9546).

Best Stallion in Classes 34 to 37—Champion Premium of £10, given by Mr James Lockhart, Mains of Arries.

The Marquis of Londonderry, K.G., Seaham Hall, Seaham Harbour, "Holyrood" (9546).

Breeder of best Male Animal of any age in Classes 34 to 37—Silver Medal.

The Marquis of Londonderry, K.G., Seaham Hall, Seaham Harbour.

CLASS 34. STALLION, foaled before 1st January 1892.—Premiums, £15, £12, £8, and £4.

- 1st. The Marquis of Londonderry, K.G., Seaham Hall, Seaham Harbour, "Holyrood" (9546).
- 2d. J. Douglas Fletcher of Rosehaugh, Avoch, R.S.O., "Prince Albert of Rosehaugh" (9357).
- 3d. R. C. Macfarlane, Greenburn, Doune, "Gold Mine" (9540).
- 4th. A. M'Robbie, Sunnyside, Aberdeen, "Prince Stephen" (9363).
- V.H.C. A Grandage, Bramhope, near Leeds (9178).
- H.C. John Crawford, jun., Manraehead, Beith, "Royal Reward."
- C. D. Riddell, Blackhall, Paisley, "Poplar."

CLASS 35. ENTIRE COLT, foaled in 1892.—Premiums, £15, £12, £8, and £4.

- 1st. J. Douglas Fletcher of Rosehaugh, Avoch, R.S.O., "Maceachran" (9792).
- 2d. A. & W. Montgomery, Nether Hall and Banks, Kirkcudbright, "Macfie" (9794).
- 3d. Matthew Marshall, Bridgebank, Stranraer, "Vanguard."
- 4th. William Park, Brunstane, Portobello, "Prince of Brunstane" (9977).
- V.H.C. W. S. Park, Hatton, Bishopton, "Prince of Airies."
- H.C. John Pollock, Paper Mill, Langside, Glasgow, "Lord Loudon" (9986).
- C. John Duncan, Rhubodach, Rothesay, "Prince Rosemount" (9992).

CLASS 36. ENTIRE COLT, foaled in 1893.—Premiums, £15, £10, £6, and £3.

- 1st. William Curr, Merrylee, Cathcart, "Knight o' Cowal."
- 2d. William Graham, Eden Grove, Penrith, "Bridegroom" (9886).
- 3d. A. & W. Montgomery, Nether Hall and Banks, Kirkcudbright, "Macmartin" (9948).
- 4th. David Riddell, Blackhall, Paisley, "Nonpareil."
- V.H.C. James A. Wallace, Claycrop, Kirkcinner, "Prince of Clay."
- H.C. Hugh Andrew, Lennoxlove Acredales, Haddington, "Balgreddan Chieft" (9877).
- C. John Crawford, jun., Manraehead, Beith, "Kirkmabreck."

CLASS 37. ENTIRE COLT, foaled in 1894.—Premiums, £12, £7, £4, and £2.

- 1st. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright.
- 2d. James A. Wallace, Claycrop, Kirkcinner.
- 3d. Matthew Marshall, Bridgebank, Stranraer, "Captain Alexander."
- 4th. Alexander Scott, Berryyards Farm, Greenock, "Sir Visto."
- V.H.C. W. H. Lumsden, Balmedie, Aberdeen, "Balmedie Prince Charming."
- H.C. David Riddell, Blackhall, Paisley.
- C. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright.
- C. The Right Hon. Lord Polwarth, Mertoun House, St Boswells, N.B., "Border Prince."

PRESIDENT'S MEDAL for best Clydesdale Mare or Filly.

John Gilmour, Montrave, Leven, "Moss Rose" (6203).

Best Mare or Filly registered in the Clydesdale Stud-Book—Cawdor Challenge Cup, value 50 guineas, given by the Clydesdale Horse Society. The Cup must be won three times by an Exhibitor (but not necessarily in consecutive years or with the same animal) before it becomes his absolute property.

John Gilmour, Montrave, Leven, "Moss Rose" (6203).

CLASS 38. MARE, of any age, with Foal at foot.—
Premiums, £15, £10, £5, and £3.

- 1st. William Graham, Edengrove, Penrith, "Royal Rose."
- 2d. George Alston, Loudoun Hill, Darvel, "Vanora" (9348).
- 3d. William Park, Brunstane, Portobello, "Lady Louisa."
- 4th. J. A. Campbell, Craigie House, Ayr, "Princess Ariel" (11,240).
- V.H.C. The Right Hon. Lord Polwarth, Mertoun House, St Boswells, N.B., "Miss Daisy."
- H.C. D. B. Richardson, Haregills, Ecclefechan, "Rosebud" (9017).

CLASS 39. YELD MARE, foaled before 1st January 1892.—
Premiums, £10, £6, £3, and £2.

- 1st. John J. Moubray of Naemoor, Rumbling Bridge, "Lady Bute" (12,237).
- 2d. Thomas Smith, Blacon Point, Chester, "Belle of Fashion."
- 3d. David Mitchell, Millfield, Polmont, "Lily Langtry."
- 4th. David Mitchell, Millfield, Polmont, "Maritana."
- V.H.C. W. J. P. Beattie, Newbie, Annan, "Bonnie Doon" (12,072).
- H.C. George Alston, Loudoun Hill, Darvel, "Lady Louisa" (12,036).
- C. John J. Moubray of Naemoor, Rumbling Bridge, "Miss Macgregor."
- C. Colonel Stirling of Kippendavie, Kippenross, Dunblane, "Montrave Sybil" (11,617).

CLASS 40. FILLY, foaled in 1892.—Premiums, £10, £6, £3, and £2.

- 1st. J. Douglas Fletcher of Rosehaugh, Avoch, R.S.O., "Fuchsia."
- 2d. William Graham, Edengrove, Kirkbythore, Penrith, "May Fly."
- 3d. James Crawford, Flossend, Greta, "Queen of Greta."
- 4th. James Gray, Kersie Mains, Stirling, "Mary Mackinlay."
- V.H.C. A. B. Matthews, British Linen Bank, Newton-Stewart, N.B., "Joan of Arc."
- H.C. David M'Gibbon, Ard-na-Craig, Campbeltown, "Annie."
- C. J. A. Campbell, Craigie House, Ayr, "Laurel Blossom."

CLASS 41. FILLY, foaled in 1893.—Premiums, £10, £6, £3, and £2.

- 1st. William Graham, Edengrove, Kirkbythore, Penrith, "May Queen."
- 2d. William Renwick, Meadowfield, Corstorphine.
- 3d. James F. Murdoch, East Hallside, Newton.
- 4th. John Gilmour, Montrave, Leven, Fife, "Montrave Rebecca."
- V.H.C. Colonel Stirling of Kippendavie, Kippenross, Dunblane, "Princess May."
- H.C. J. Douglas Fletcher of Rosehaugh, Avoch, R.S.O., "Duchess of York."
- C. John Gilmour, Montrave, Leven, "Montrave Ketha."
- C. David A. Hood, Balgredan, Kirkcudbright, "Princess Ena."
- C. Alexander Guild, Greenhead, Pencaitland, "Arna."

CLASS 42. FILLY, foaled in 1894.—Premiums, £10, £6, £3, and £2.

- 1st. William Hood, Chapelton, Bogue, Kirkcudbright, "Lady Diana."
- 2d. Thomas Smith, Blacon Point, Chester, "Jessie Macgregor."
- 3d. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright.
- 4th. The Right Hon. Lord Polwarth, Mertoun House, St Boswells, N.B., "Princess Alix."
- V.H.C. William Graham, Edengrove, Kirkbythore, Penrith, "Crown Jewel."
- H.C. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright.
- C. Colonel Stirling of Kippendavie, Kippenross, Dunblane, "Lorna Doone."
- C. John Parlane, Craigdhu, Whithorn, "Macgregor's Queen."
- C. David Jamieson, Roundbush, Annan, "Fair Helen."

DRAUGHT GELDINGS.

PRESIDENT'S MEDAL for best Draught Gelding.

William Clark, Netherlee, Cathcart, "Topsman."

CLASS 43. DRAUGHT GELDING, foaled before 1st January 1892.—
Premiums, £8, £4, and £2.

- 1st. William Clark, Netherlee, Cathcart, "Topsman."
- 2d. James Crawford, Flosshend, Gretna, "Prince."
- 3d. Robert Beaty Hetherington, Drumcruilton, Thornhill, "Bob."
- V.H.C. Hugh Andrew, Lennoxlove Acredales, Haddington, "Bob Burns."
- H.C. Sir R. G. Musgrave, Bart., Edenhall, Langwathby, R.S.O., Cumberland, "Scot."

CLASS 44. DRAUGHT GELDING, foaled in 1892.—Premiums, £5, £3, and £2,
given by Mr Maxwell of Munches.

- 1st. William Clark, Netherlee, Cathcart.
- 2d. A. B. Matthews, British Linen Bank, Newton-Stewart, N.B., "Jingo."
- 3d. Andrew Mitchell, Barcheskie, Kirkcudbright, "Bruiser."
- V.H.C. J. & W. McQueen, Broomfield, Sanguhar.
- H.C. Robert Beaty Hetherington, Drumcruilton, Thornhill, "Victor."
- C. The Earl of Durham, Bowes House Farm, Fence Houses, "Wigton."

CLASS 45. DRAUGHT GELDING, foaled in 1893.—Premiums, £5, £3, and £2,
given by Mr Maxwell of Munches.

- 1st. William Clark, Netherlee, Cathcart.
- 2d. William Crawford, Carruchan Farm, Dumfries.
- 3d. James Lang, Kelton Grange, Dumfries, "Geordy."
- V.H.C. Welwood H. Maxwell of Munches, Dalbeattie, "Prince."
- H.C. Homer Young, Redhills, Torthorwald, Dumfries.
- C. James M'Adam, Craigley, Castle-Douglas, "Ronald."

ROAD OR FIELD.

PRESIDENT'S MEDAL for best Hunter.

R. W. B. Jardine, yr. of Castlemilk, Lockerbie, Gelding, "Pirate."

CLASS 46. BROOD MARE, suitable for breeding Hunters, with Foal at foot,
in hand.—Premiums, £10, £5, and £3.

- 1st. John M'Kie, Ernespie, Castle-Douglas, "Sweet Nell."
- 2d. J. A. Clarke, Annbank, "Sally."
- 3d. George R. Fortune, Pilmuir, Largo, "The Nun."
- V.H.C. Donald T. Martin, Girgenti, Irvine, "Winnie."

CLASS 47. HUNTER, Mare or Gelding, foaled before 1st January 1892, able to carry
over 14 stone, *in saddle*.—Premiums, £12, £6, and £3.

- 1st. R. W. B. Jardine, yr. of Castlemilk, Lockerbie, Gelding, "Pirate."
- 2d. Alexander Cross, Eastbank, Langbank, Gelding, "Jamieson."
- 3d. George R. Fortune, Pilmuir, Largo, Gelding, "Amulrie."
- V.H.C. James J. L. Irving, Parkgate, Blackburn, Lancashire, Gelding, "The Duke."
- H.C. Alexander Cross, Eastbank, Langbank, Gelding, "Roberts."
- C. Archibald Kerr, Upper Dormont, Lockerbie, Gelding, "Gaybrook."

CLASS 48. HUNTER, Mare or Gelding, foaled before 1st January 1892, able to carry
from 12 to 14 stone, *in saddle*.—Premiums, £8, £4, and £2.

- 1st. J. Rutherford, Summerhill, Annan, Mare, "Miss Kate."
- 2d. Thompson & Sons, Kirkhouse, Brampton Junction, Carlisle, Mare, "Lady Marjory."
- 3d. J. A. Critchley, Stapleton Towers, Annan, Gelding, "Border Chief."
- V.H.C. Miss Heron Maxwell, Teviot Bank, Hawick, Mare, "Jess."
- H.C. J. J. J. Keswick, Dormont, Lockerbie, Gelding, "Bluestone"

CLASS 49. MARE or GELDING, for field, foaled in 1892, *in hand*.—
Premiums, £6, £4, and £2.

- 1st. John W. J. Paterson, Terrona, Langholm, Gelding, "Gowanbank."
- 2d. John W. J. Paterson, Terrona, Langholm, Gelding, "Kilteel."
- 3d. Hugh Patrickson, Kirkclinton Park, Carlisle, Gelding, "Moorside."
- V.H.C. Miss M'Douall, Logan, Stranraer, Gelding, "Sir Thomas."
- H.C. E. H. Banks, Highmoor, Wigton, Mare.

CLASS 50. MARE or GELDING, for field, foaled in 1893, *in hand*.—
Premiums, £6, £4, and £2.

- 1st. John C. Toppin, Musgrave Hall, Penrith, Gelding, "The Colonel."
- 2d. William Shaw, Deanview, Kilmarnock, Mare, "Lizzie."
- 3d. John W. J. Paterson, Terrona, Langholm, Mare, "Gowanbrae."
- V.H.C. J. P. Laurie, Shieldhill, Lochmaben, Mare, "Rose."
- H.C. David J. Jardine of Jardine Hall, Lockerbie.

PRESIDENT'S MEDAL for best Roadster.

John M'Kie, Ernespie, Castle-Douglas, Mare, "Maythorn."

CLASS 51. ROADSTER, Mare or Gelding, foaled before 1st January 1892,
15 hands and upwards, *in saddle*.—Premiums, £8, £4, and £2.

- 1st. John M'Kie, Ernespie, Castle-Douglas, Mare, "Maythorn."
- 2d. W. Rush, Glenterras, Langholm, Mare, "Princess."
- 3d. T. Kay Barnes, Banker's Hill, Carlisle, Mare, "Barmaid."

CLASS 52. ROADSTER, Mare or Gelding, foaled before 1st January 1892,
14.2 and under 15 hands, *in saddle*.—Premiums, £8, £4, and £2.

- 1st. J. N. Robinson, Kirkandrews-on-Eden, Carlisle, Mare, "Lady Golightly."
- 2d. Charles E. Galbraith, Ayton Castle, Ayton, N.B., Mare, "Linda" (4235).
- 3d. G. Russell Tress, Whitelee, St Boswells, Mare, "Belle of the Wolds" (1437).
- V.H.C. Mrs Mather, Grovehill, Thornhill, Mare, "Lady of the Manor" (6940).
- H.C. Andrew Hunter, Braehead House, Cathcart, Mare, "Waitress" (6289).

CLASS 53. COLT, GELDING, or FILLY, foaled in 1894, the produce of Thoroughbred Stallions, out of Mares of any breed.—Five Prizes—£10, £7, £5, £2, and £1, given by Mr Gilmour of Montrave.

- 1st. John C. Toppin, Musgrave Hall, Penrith, Colt, "Gamester."
- 2d. Thompson & Sons, Kirkhouse, Brampton Junction, Carlisle.
- 3d. E. H. Banks, Highmoor, Wigton, Filly.
- 4th. R. W. B. Jardine, jr. of Castlemilk, Lockerbie, Colt.
- 5th. J. Rutherford, Summerhill, Annan, Gelding.

HACKNEYS.

(ALL TO BE SHOWN IN HAND.)

PRESIDENT'S MEDAL for best Hackney.

Charles E. Galbraith, Ayton Castle, Ayton, N.B., "Danish Lady" (6559).

Best Mare or Filly in Hackney or Pony Classes—Prize of £10 and Bronze Medal, given by the Hackney Horse Society. A Mare 6 years old or more must have had a living foal. Winners of the Hackney Society's Medals in 1895, except at the London and Royal English Shows, excluded. The winner must be entered or accepted for entry in Hackney Stud-Book, and certified free from hereditary disease.

Charles E. Galbraith, Ayton Castle, Ayton, N.B., "Danish Lady" (6559).
Reserve. David Mitchell, Millfield, Polmont, "Sabina."

CLASS 54. STALLION, any Age, over 14.2 hands, registered in the Hackney Stud-Book.—Premiums, £10, £5, and £2.

- 1st. Charles E. Galbraith, Ayton Castle, Ayton, N.B., "Danebury" (4724).
- 2d. Alexander Morton, Gowanbank, Darvel, "Glenlyon" (4788).
- 3d. J. G. Mackie, Auchencairn, Castle-Douglas, "Sir Wilton" (4511).
- C. A. B. Matthews, British Linen Bank, Newton-Stewart, N.B., "Who Goes There" (5063).

CLASS 55. BROOD MARE, 15 hands and upwards, with Foal at foot, or to foal this season to a registered sire. Registered in the Hackney Stud-Book.—Premiums, £10, £5, and £2.

- 1st. Charles E. Galbraith, Ayton Castle, Ayton, N.B., "Lola" (4248).
- 2d. Mrs Mackie, Auchencairn, Castle-Douglas, "Lady Wilton 2d" (1671).

CLASS 56. BROOD MARE, under 15 hands, with Foal at foot, or to foal this season to a registered sire. Registered in the Hackney Stud-Book.—Premiums, £8, £4, and £2.

- 1st. Charles E. Galbraith, Ayton Castle, Ayton, N.B., "Danish Lady" (6559).
- 2d. Mrs Mackie, Auchencairn, Castle-Douglas, "Lady Wilton 3d" (5667).
- 3d. John Hyslop, 18 Buccleuch Street, Dumfries, "Bessie Bell."

CLASS 57. FILLY, foaled in 1892, got by registered hackney sire.—Premiums, £6, £4, and £2.

- 1st. Alexander Morton, Gowanbank, Darvel, "Lasona" (6991).
- 2d. John Bell, Moorhouse, Orton, Tebay, Westmoreland, "Lady Lizzie."
- 3d. Alexander Morton, Gowanbank, Darvel, "Sweet Auburn" (7480).

CLASS 58. FILLY, foaled in 1893, got by registered hackney sire.—Premiums, £6, £4, and £2.

- 1st. David Mitchell, Millfield, Polmont, "Sabina."
- 2d. Charles E. Galbraith, Ayton Castle, Ayton, N.B., "Lady Kate" (8092).
- 3d. John Agnew, Branshiel House, Braidwood, Carlisle, "Lady Ayton" (8015).
- C. William Murray, Borrowmoss, Wigtown, "Sweetbriar."

CLASS 59. FILLY, foaled in 1894, got by registered hackney sire.—Premiums, £6, £4, and £2.

- 1st. James M'Meeken, Carnbooth, Busby, "Daisy Danegelt."
- 2d. John Agnew, Branshiel House, Braidwood, Carlisle, "Lady Grace."
- 3d. James M'Meeken, Carnbooth, Busby, "Lady Crompton."
- C. Mrs Mackie, Auchencairn, Castle-Douglas.

CLASS 60. ENTIRE COLT, foaled in 1893, registered in Hackney Stud-Book.—Premiums, £6, £4, and £2.

- 1st. Charles E. Galbraith, Ayton Castle, Ayton, N.B., "Cato 3d" (5127).
- 2d. The Marquis of Londonderry, K.G., Seaham Hall, Seaham Harbour, "Runnymede 2d" (5393).
- 3d. J. A. Mather, Grovehill, Thornhill, "Reflection."

CLASS 61. ENTIRE COLT, foaled in 1894, eligible for entry in Hackney Stud-Book.—Premiums, £6, £4, and £2.

- 1st. Alexander Morton, Gowanbank, Darvel, "Gillfoot."
- 2d. Charles E. Galbraith, Ayton Castle, Ayton, N.B., "Birthday."
- 3d. James Lawson Drew, Duonhill, Newton-Stewart.
- C. David Mitchell, Millfield, Polmont.

DRIVING COMPETITIONS.

CLASS 62. Best TURN-OUT of SINGLE HORSE, HARNESS, and TRAP, to be driven in the ring, 15 hands and upwards.—Premiums, £8, £4, and £2.

- 1st. W. Moore, Greenhall, High Blantyre, Gelding, "Duke of York."
- 2d. Mrs Mather, Grovehill, Thornhill, Mare, "Queen of the Manor" (8401).
- 3d. Thomas Galloway, Glenlowrum, Bearsden, Mare, "Lady May."

CLASS 63. Best TURN-OUT of SINGLE HORSE, HARNESS, and TRAP, to be driven in the ring, under 15 hands.—Premiums, £8, £4, and £2.

- 1st. Mrs Mather, Grovehill, Thornhill, Gelding, "Fashion."
- 2d. Wm. W. Galbraith, Croftfoot, Gartcosh, Mare, "Apology" (1426).
- 3d. G. Russell Tress, Whitelee, St Boswells, Mare, "Belle of the Wolds" (1437).
- H.C. Mrs Mather, Grovehill, Thornhill, Mare, "Lady of the Manor" (6940).
- C. Donald Macdonald MacRae, Stenhouse, Thornhill, Hackney Stallion, "Tommy 2d."

PONIES.

PRESIDENT'S MEDAL for best Pony.

Alexander Morton, Gowanbank, Darvel, "Sir George 2d" (1611).

CLASS 64. STALLION, over 12, not exceeding 14.2 hands.—
Premiums, £4, £2, and £1.

- 1st. Alexander Morton, Gowanbank, Darvel, "Sir George 2d" (1611).
- 2d. J. A. Mather, Grovehill, Thornhill, "Better than Ever."
- 3d. J. N. Munro Mackenzie, Calgary, Tobermory, Mull, "The Syrian."

CLASS 65. MARE or GELDING, between 13 and 14½ hands.—
Premiums, £4, £2, and £1.

- 1st. Alexander Morton, Gowanbank, Darvel, Mare.
- 2d. Mrs Mackie, Auchencairn, Castle-Douglas, Gelding, "Merrylegs."
- 3d. Andrew Hunter, Braehead House, Cathcart, Mare, "Mirette."
- V.H.C. J. A. Mather, Grovehill, Thornhill, Mare, "Lady Dalkeith."
- H.C. Miss M. Anderson, Barskimming, Mauchline, Ayrshire, Mare, "Gold Flash."
- C. Alfred Mather, Grovehill, Thornhill, Gelding, "Nithsdale Swell."

CLASS 66. MARE or GELDING, between 12 and 13 hands.—
Premiums, £4, £2, and £1.

- 1st. The Marquis of Londonderry, K.G., Seaham Hall, Seaham Harbour, Mare, "Flower Girl."
- 2d. Miss M. Anderson, Barskimming, Mauchline, Mare, "Debenture."
- 3d. Robert Beaty Hetherington, Drumcruilton, Thornhill, Gelding, "Bobbie."
- V.H.C. T. Chambers, Howes, Annan, Mare, "Rosebud."

CLASS 67. STALLION, under 12 hands.—Premiums, £4, £2, and £1.

- 3d. Donald Macdonald MacRae, Stenhouse, Thornhill, "Ivor."

EXTRA.

H.C. Donald Macdonald MacRae, Stenhouse, Thornhill, Hackney Stallion, "Tommy 2d."

CLASS 68. MARE or GELDING, under 12 hands.—Premiums, £4, £2, and £1.

- 1st. A. L. Miller, Ravensdowne, Berwick-on-Tweed, Gelding, "Cinder."
- 2d. Robert W. Fergusson, Kilquhanity, Dalbeattie, N.B., Mare, "Ruby."
- 3d. The Marquis of Londonderry, K.G., Seaham Hall, Seaham Harbour, Mare, "Vesta."
- V.H.C. The Hon. Angus Mc'Donnall, Glenarm Castle, Glenarm, Co. Antrim, Gelding, "Joseph Grimaldi."

SHETLAND PONIES.

PRESIDENT'S MEDAL for best Shetland Pony.

The Marquis of Londonderry, K.G., Seaham Hall, Seaham Harbour, "Excellent."

CLASS 69. STALLION, not exceeding 10½ hands, foaled before 1st January 1892.—Premiums, £4, £2, and £1.

- 1st. The Marquis of Londonderry, K.G., Seaham Hall, Seaham Harbour, "Excellent."
- 2d. The Marquis of Londonderry, K.G., Seaham Hall, Seaham Harbour, "Muness."
- 3d. Thomas Hadley and Bros., Holmside Old Hall, Chester-le-Street, "Sir John."

CLASS 70. MARE, not exceeding 10½ hands, with Foal at foot.—
Premiums, £4, £2, and £1.

- 1st. The Marquis of Londonderry, K.G., Maryfield Farm, Bressay, Lerwick, Shetland, "Princess."
- 2d. The Marquis of Londonderry, K.G., Maryfield Farm, Bressay, Lerwick, Shetland, "Bretta."

CLASS 71. MARE or GELDING, 10½ hands, foaled before 1st January 1892.
—Premiums, £4, £2, and £1.

- 1st. The Marquis of Londonderry, K.G., Maryfield Farm, Bressay, Lerwick, Shetland, Mare, "Thora."

JUMPING COMPETITIONS.

Champion Prize of £10, given by various Contributors, for most points in Prizes for Jumping by one Exhibitor with one or more horses in the Jumping Competitions.

Conditions.—First Prize to count three points; Second Prize, two points; and Third Prize, one point. The money to be evenly divided in the event of a tie.

Wednesday, 24th July.

CLASS 1. HORSES, Open.—Premiums, £20, £10, and £5.

- 1st. Wm. Cusson, Dun Cow Hotel, Chester-le-Street, Co. Durham, Gelding, brown.
2d. Wm. Cusson, Dun Cow Hotel, Chester-le-Street, Co. Durham, Mare, brown.
3d. R. Swinhoe, 5 Cross Street, Newcastle, Gelding, "Somnus."

CLASS 2. PONIES, 14½ hands and under.—Premiums, £5, £3, and £1.

- 1st. R. Swinhoe, 5 Cross Street, Newcastle, Mare, "Songstress."
2d. George Paterson, 47 Carrick Street, Ayr, Mare, "Surprise."

Thursday, 25th July.

CLASS 3. HORSES, Open Handicap, hurdles and gate being raised 8 inches for the winner of the first prize, and 4 inches for the winner of the second prize in Class 1.—Premiums, £10, £6, and £3.

- 1st. Wm. Cusson, Dun Cow Hotel, Chester-le-Street, Co. Durham, Mare, black brown.
2d. R. Swinhoe, 5 Cross Street, Newcastle, Gelding, "Somnus."
3d. Wm. Cusson, Dun Cow Hotel, Chester-le-Street, Co. Durham, Gelding, brown.

CLASS 4. PONIES, 14½ hands or under, Handicap, hurdles and gate being raised 4 inches for the first prize winner in Class 2.—Premiums, £5, £3, and £1.

- 1st. R. Swinhoe, 5 Cross Street, Newcastle. Mare, "Songstress."
2d. Lt. Ewing Paterson, Inniskilling Dragoons, Piershill Barracks, Edinburgh, Gelding, "Piccadilly Punch."
3d. George Paterson, 47 Carrick Street, Ayr, Mare, "Surprise."

Friday, 26th July.

CLASS 5. HORSES, Open Handicap, hurdles and gate being raised 8 inches for the winner of the first prize, and 4 inches for the winner of the second prize in either of Classes 1 or 3—4 inches extra for the winner of the two first prizes in Classes 1 and 3.—Premiums, £10, £6, and £3.

- 1st. Wm. Cusson, Dun Cow Hotel, Chester-le-Street, Co. Durham, Gelding, brown.
2d. Marius Bell, Broats, Annan, Mare, "Border Witch."
3d. Wm. Cusson, Dun Cow Hotel, Chester-le-Street, Co. Durham, Mare, brown black.

CLASS 6. PONIES, 14½ hands or under, Handicap, hurdles and gate being raised 4 inches for the winner of the first prize in Class 2 or in Class 4, and 8 inches for winner of the first prize in both these Classes.—Premiums, £3, £2, and £1.

- 1st. Lt. Ewing Paterson, Inniskilling Dragoons, Piershill Barracks, Edinburgh, Gelding, "Piccadilly Punch."
2d. R. Swinhoe, 5 Cross Street, Newcastle, Mare, "Songstress."

CHAMPION PRIZE OF £10, given by various Contributors, for most points in Prizes for Jumping by one Exhibitor with one or more horses in above Classes—First Prize to count three points, Second Prize two points, and Third Prize one point—the money to be evenly divided in the event of a tie.

William Cusson, Dun Cow Hotel, Chester-le-Street, Co. Durham, thirteen points.

SHEEP

BLACKFACED.

PRESIDENT'S MEDAL for best Pen of Blackfaced Sheep in Classes 72 to 77.

Charles Howatson of Glenbuck, N.B.

CLASS 72. TUP, three Shear or upwards.—Premiums, £10, £5, and £3.

- 1st. Charles Howatson of Glenbuck, N.B.
- 2d. The Duke of Argyll, K.G., Ballymenach, Campbeltown.
- 3d. John Fisher, Auchrioch, Tyndrum.
- V.H.C. John Craig, Innergeldie, Comrie.

CLASS 73. TUP, two Shear.—Premiums, £10, £5, and £3.

- 1st. Charles Howatson of Glenbuck, N.B.
- 2d. R. & J. Cadzow, Borland, Biggar.
- 3d. J. Archibald, Overshiels, Stow.
- V.H.C. J. Archibald, Overshiels, Stow.
- H.C. Peter Fisher, Braes of Ardeonaig, Killin.
- C. James Moffat, Gateside, Sanquhar.

Best Blackfaced Shearling Tup in Classes 74 and 75—Champion Prize of £10, given by Mr Howatson of Glenbuck.

R. & J. Cadzow, Borland, Biggar.

CLASS 74. SHEARLING TUP.—Premiums, £10, £5, and £3.

- 1st. Charles Howatson of Glenbuck, N.B.
- 2d. Charles Howatson of Glenbuck, N.B.
- 3d. Charles Howatson of Glenbuck, N.B.
- V.H.C. R. & J. Cadzow, Borland, Biggar.
- H.C. Charles Howatson of Glenbuck, N.B.
- C. Charles Howatson of Glenbuck, N.B.

CLASS 75. Five SHEARLING TUPS, bred and fed by Exhibitor.—Prizes £15, £10, and £5. Given by Mr Howatson of Glenbuck.

- 1st. R. & J. Cadzow, Borland, Biggar.
- 2d. James Hamilton, Woolfords, Cobbinshaw.
- 3d. James R. Dempster, Brownhill, Strathaven.
- V.H.C. The Duke of Argyll, K.G., Ballymenach, Campbeltown.
- H.C. James Macfarlane, Ashiestiel, Gala-hiels.
- C. John Murray, Midcrosswood, West Calder.

Best Pen of Blackfaced Ewes or Gimmers in Classes 76 and 77—Champion Prize of £10, given by Sir T. D. Gibson-Carmichael, M.P., Bart.

Donald T. Martin, Girgenti, Irvine.

CLASS 76. Three EWES, above one Shear, with their Lambs at foot.—Premiums, £8, £4, and £2.

- 1st. Donald T. Martin, Girgenti, Irvine.
- 2d. James Moffat, Gateside, Sanquhar.
- 3d. James R. Dempster, Brownhill, Strathaven.
- H.C. John Craig, Innergeldie, Comrie.
- C. Captain F. G. Blair of Blair, Dalry, Ayrshire.

CLASS 77. Three SHEARLING EWES or GIMMERS.—Premiums, £8, £4, and £2.

- 1st. Donald T. Martin, Girgenti, Irvine.
- 2d. John K. Borland, North Balloch, Girvan.
- 3d. James R. Dempster, Brownhill, Strathaven.
- V.H.C. The Duke of Argyll, K.G., Ballymenach, Campbeltown.
- H.C. Donald T. Martin, Girgenti, Irvine.
- C. The Duke of Argyll, K.G., Ballymenach, Campbeltown.

CHEVIOT.

PRESIDENT'S MEDAL for best Pen of Cheviot Sheep in Classes 78 to 81.

John Elliot, Hindhope, Jedburgh.

CLASS 78. TUP, above one Shear.—Premiums, £10, £5, and £3.

- 1st. John Elliot, Hindhope, Jedburgh.
- 2d. Jacob Robson, Byrness, Otterburn, Northumberland.
- 3d. John A. Johnstone, Archbank, Moffat.
- V.H.C. John A. Johnstone, Archbank, Moffat.
- H.C. John Robson, Newton, Bellingham.
- C. John Elliot, Hindhope, Jedburgh.

CLASS 79. SHEARLING TUP.—Premiums, £10, £5, and £3.

- 1st. John Elliot, Hindhope, Jedburgh.
- 2d. Jacob Robson, Byrness, Otterburn, Northumberland.
- 3d. Jacob Robson, Byrness, Otterburn, Northumberland.
- V.H.C. John Elliot, Hindhope, Jedburgh.
- H.C. John Robson, Newton, Bellingham.
- C. John A. Johnstone, Archbank, Moffat.

CLASS 80. Three EWES, above one Shear, with their Lambs at foot.—
Premiums, £8, £4, and £2.

- 1st. John Robson, Newton, Bellingham.
- 2d. Jacob Robson, Byrness, Otterburn, Northumberland.
- 3d. John Robson, Newton, Bellingham.
- V.H.C. Jacob Robson, Byrness, Otterburn, Northumberland.

CLASS 81. Three SHEARLING EWES or GIMMERS.—Premiums, £8, £4, and £2.

- 1st. John Robson, Newton, Bellingham.
- 2d. Andrew & James K. Smith, Thorlieshope, Newcastleton.
- 3d. Jacob Robson, Byrness, Otterburn, Northumberland.
- V.H.C. John Robson, Newton, Bellingham.
- H.C. Andrew T. Elliot, Newhall, Gala-hiels.

BORDER LEICESTER.

PRESIDENT'S MEDAL for best Pen of Border Leicesters in Classes 82 to 85.

His Grace The Duke of Buccleuch and Queensberry, K.T., Dalkeith Park, Dalkeith.

CLASS 82. TUP, above one Shear.—Premiums, £10, £5, and £3.

- 1st. Andrew Smith, Longniddry.
- 2d. The Duke of Buccleuch and Queensberry, K.T., Dalkeith Park, Dalkeith.
- 3d. Somner Logan, Harrietfield, Kelso.
- V.H.C. William Heslop, Westside House, Staindrop, Darlington.
- H.C. The Earl of Rosebery, Dalmeny Park, Edinburgh.
- C. G. Russell Tress, Whitelee, St Boswells.

CLASS 83. SHEARLING TUP.—Premiums, £10, £5, and £3.

- 1st. Thomas Clark, Oldhamstocks Mains, Cockburnspath.
- 2d. G. Russell Tress, Whitelee, St Boswells.
- 3d. George Robson, Springwells, Greenlaw.
- V.H.C. John M. Twentyman, Hawkrigg House, Wigton, Cumberland.
- H.C. His Grace The Duke of Buccleuch and Queensberry, K.T., Dalkeith Park, Dalkeith.
- C. Thomas Clark, Oldhamstocks Mains, Cockburnspath.

CLASS 84. Three EWES, above one Shear.—Premiums, £8, £4, and £2.

- 1st. Andrew Smith, Longniddry.
- 2d. The Right Hon. A. J. Balfour, M.P., Whittinghame, Prestonkirk.
- 3d. George Robeson, Springwells, Greenlaw.
- H.C. The Earl of Rosebery, Dalmeny Park, Edinburgh.
- C. Matthew Templeton, Dromore Farm, Kirkcudbright.

CLASS 85. Three SHEARLING EWES or GIMMERS.—Premiums, £8, £4, and £2.

- 1st. His Grace The Duke of Buccleuch and Queensberry, K.T., Dalkeith Park, Dalkeith.
- 2d. The Right Hon. A. J. Balfour, M.P., Whittinghame, Prestonkirk.
- 3d. Thomas Clark, Oldhamstocks Main, Cockburnspath.
- V.H.C. The Earl of Rosebery, Dalmeny Park, Edinburgh.
- H.C. Alexander Cross, Knockdon, Maybole.
- C. John M. Twentyman, Hawkrigg House, Wigton, Cumberland.

SHROPSHIRE.

PRESIDENT'S MEDAL for best Pen of Shropshires in Classes 86 to 89.

David Buttar, Corston, Coupar-Angus.

CLASS 86. TUP, above one Shear.—Premiums, £6, £4, and £2.

- 1st. David Buttar, Corston, Coupar-Angus.
- 2d. David Buttar, Corston, Coupar-Angus.
- 3d. The Earl of Strathmore, Glamis Castle, Glamis.
- V.H.C. David Buttar, Corston, Coupar-Angus.

CLASS 87. SHEARLING TUP.—Premiums, £6, £4, and £2.

- 1st. David Buttar, Corston, Coupar-Angus.
- 2d. David Buttar, Corston, Coupar-Angus.
- 3d. David Buttar, Corston, Coupar-Angus.
- V.H.C. David Buttar, Corston, Coupar-Angus.
- H.C. David Buttar, Corston, Coupar-Angus.

CLASS 88. Three EWES, above one Shear.—Premiums, £5, £3, and £2.

- 1st. David Buttar, Corston, Coupar-Angus.
- 2d. David Buttar, Corston, Coupar-Angus.
- 3d. John Jordan & Sons, Oakdene, Kendal.

CLASS 89. Three SHEARLING EWES or GIMMERS.—
Premiums, £5, £3, and £2.

- 1st. David Buttar, Corston, Coupar-Angus.
- 2d. David Buttar, Corston, Coupar-Angus.
- 3d. The Earl of Strathmore, Glamis Castle, Glamis.
- V.H.C. John Jordan & Sons, Oakdene, Kendal.

HALF-BRED.

PRESIDENT'S MEDAL for best Pen of Half-bred Sheep in Classes 90 to 93.

John Bertram, Addinston, Lauder.

CLASS 90. TUP, above one Shear.—Premiums, £6, £4, and £2.

- 1st. John Simson, Oxnam Row, Jedburgh.
- 2d. John Simson, Oxnam Row, Jedburgh.
- 3d. Somner Logan, Harrietfield, Kelso.

CLASS 91. SHEARLING TUP.—Premiums, £6, £4, and £2.

- 1st. John Bertram, Addinston, Lauder.
- 2d. John Bertram, Addinston, Lauder.

- 3d. Andrew T. Elliot, Newhall, Galashiels.
 V.H.C. Andrew T. Elliot, Newhall, Galashiels.
 H.C. Somner Logan, Harrietfield, Kelso.
 C. Andrew T. Elliot, Newhall, Galashiels.

CLASS 92. Three EWES, above one Shear.—Premiums, £5, £3, and £2.

No Entry.

CLASS 93 Three SHEARLING EWES or GIMMERS.—
 Premiums, £5, £3, and £2.

- 1st. John Bertram, Addinston, Lauder.

EXTRA SECTIONS.

Best Pens of Cross-bred Lambs in Class 96 got by Shropshire Tups—First Prize, £5; Second, £3; Third, £2—given by Scotch Breeders of Shropshire Sheep, per Mr David Buttar.

- 1st. Alexander Anderson, Berryhill, Dundee.
 2d. Alexander Anderson, Berryhill, Dundee.
 3d. The Earl of Rosebery, Dalmeny Park, Edinburgh.

CLASS 94. Three BLACKFACED WETHERS, one Shear.—Premiums, £4 and £2.

- 1st. The Earl of Rosebery, Dalmeny Park, Edinburgh.
 2d. John Gilmour of Lundin and Montrave, Leven.
 V.H.C. John Gilmour of Lundin and Montrave, Leven.
 H.C. John Gilmour of Lundin and Montrave, Leven.

CLASS 95. Three CHEVIOT WETHERS, one Shear.—Premiums, £4 and £2.

- 1st. A. B. Matthews, British Linen Bank, Newton-Stewart.
 2d. J. P. Laurie, Shieldhill, Lochmaben.
 H.C. The Earl of Rosebery, Dalmeny Park, Edinburgh.

CLASS 96. Five FAT LAMBS, any Breed or Cross.—Premiums, £4 and £2.

- 1st. Alex. Anderson, Berryhill, Dundee.
 2d. Alex. Anderson, Berryhill, Dundee.
 V.H.C. John M'Dowall, Girdlingwood, Kirkcudbright.
 C. Sir Robert Jardine, Bart., of Castlemilk, Lockerbie.

EXTRA SHEEP.

The following was Very Highly Commended:—

William Ford, Fentonbarn, Drem, Suffolk Shearling Tup.

SWINE

In accordance with a representation from the Board of Agriculture, it was resolved, in view of the prevalence of Swine Fever, to exclude Swine from the Show. Twenty-six pens had been entered.

POULTRY

First Premium—*One Sovereign.* Second Premium—*Ten Shillings.* One Commended Ticket—in all the Sections.

CLASS 1. DORKING, Silver Grey. Cock.

- 1st. Bisset & Laing, Auchtermuchty.
 2d. Robert Shields, Enoch Bank, Thornhill.

CLASS 2. DORKING, Silver Grey. Hen.

- 1st. Bisset & Laing, Auchtermuchty.
 2d. Bisset & Laing, Auchtermuchty.

CLASS 3. DORKING, Silver Grey. Cockerel.

- 1st. Bisset & Laing, Auchtermuchty.
 2d. C. G. Meldrum, Mauch of Logierait, Ballinluig.

CLASS 4. DORKING, Silver Grey. Pullet.

- 2d. Bisset & Laing, Auchtermuchty.

CLASS 5. DORKING, Coloured. Cock.

- 1st. Leonard Pilkington, Cavens, Dumfries.
 2d. Leonard Pilkington, Cavens, Dumfries.
 C. John Gillies, Edington Mills, Chirnside.

CLASS 6. DORKING, Coloured. Hen.

- 1st. Leonard Pilkington, Cavens, Dumfries.
 2d. Andrew Crichton, Estates Office, Glamis.
 C. Leonard Pilkington, Cavens, Dumfries.

CLASS 7. DORKING, Coloured. Cockerel.

- 1st. Leonard Pilkington, Cavens, Dumfries.
 2d. Andrew Crichton, Estates Office, Glamis.
 C. Leonard Pilkington, Cavens, Dumfries.

CLASS 8. DORKING, Coloured. Pullet.

- 1st. Andrew Crichton, Estates Office, Glamis.
 2d. John Gillies, Edington Mills, Chirnside.
 C. Leonard Pilkington, Cavens, Dumfries.

CLASS 9. COCHIN-CHINA. Cock.

- 1st. R. McMillan, Main Street, Barrhead.
 2d. Dr Richmond, 57 Love Street, Paisley.
 C. J. A. Mather, Grovehill, Thornhill.

CLASS 10. COCHIN-CHINA. Hen.

- 1st. R. McMillan, Main Street, Barrhead.
 2d. Dr Richmond, 57 Love Street, Paisley.
 C. Mrs Leslie, 28 Elmfield Avenue, Aberdeen.

CLASS 11. COCHIN-CHINA. Cockerel.

- 1st. Mrs Leslie, 28 Elmfield Avenue, Aberdeen.

CLASS 12. COCHIN-CHINA. Pullet.

- 2d. Mrs Leslie, 28 Elmfield Avenue, Aberdeen.

CLASS 13. BRAHMAPOOTRA. Cock.

- 1st. John Gillies, Edington Mills, Chirnside.
 2d. Mrs James Lorimer, 24 Whitehall Street, Dundee.

CLASS 14. BRAHMAPOOTRA. Hen.

- 1st. John Gillies, Edington Mills, Chirnside.
 2d. D. J. Thomson Gray, Innerpeffer Lodge, Crieff.
 C. D. J. Thomson Gray, Innerpeffer Lodge, Crieff.

CLASS 15. BRAHMAPOOTRA. Cockerel.

- 2d. James Lorimer, Sandridge Cottage, Monifieth.

CLASS 16. BRAHMAPOOTRA. Pullet.

- 1st. James Lorimer, Sandridge Cottage, Monifieth.

CLASS 17. SCOTCH GREY. Cock.

- 1st. W. S. Mitchell, Castle Orchards, Airth, Larbert.
 2d. William M'Kinnon, Stenhousemuir, Larbert.
 C. Dr Richmond, 57 Love Street, Paisley.

CLASS 18. SCOTCH GREY. Hen.

- 1st. Matthew Smith, Townhead Farm, Thornhill.
 2d. Dr Richmond, 57 Love Street, Paisley.
 C. W. S. Mitchell, Castle Orchards, Airth, Larbert.

CLASS 19. SCOTCH GREY. Cockerel.

- 1st. A. W. Henderson, Airthrey Mills, Bridge of Allan.
 2d. A. W. Henderson, Airthrey Mills, Bridge of Allan.
 C. Dr Richmond, 57 Love Street, Paisley.

CLASS 20. SCOTCH GREY. Pullet.

- 1st. Matthew Smith, Townhead Farm, Thornhill.
 2d. A. W. Henderson, Airthrey Mills, Bridge of Allan.
 C. Archibald Mitchell, Airth Castle, Larbert.

CLASS 21. HAMBURG. Cook.

- 1st. Stephen Brotherston, Buteland, Balerno.
 2d. A. B. Craig, Carscadden, Duntocher, N.B.
 C. Thomas Hunter, Ardoch, Thornhill.

CLASS 22. HAMBURG. Hen.

- 1st. John Fergusson, Auchengate, Dalbeattie.
 2d. William Adamson, Devonside, Thankerton.
 C. James Huntly, Edington Mills, Chirnside.

CLASS 23. HAMBURG. Cockerel.

- 1st. James Aitken, Bridge Street, Girvan.
 2d. James Huntly, Edington Mills, Chirnside.

CLASS 24. HAMBURG. Pullet.

- 1st. Maurice Jackson, High Green Farm, Silsden, near Keighley, Yorkshire.
 2d. James Huntly, Edington Mills, Chirnside.

CLASS 25. PLYMOUTH ROCK. Cock.

- 1st. John Russell, Troquhain, New Galloway.
 2d. Rev. Fitzroy Lloyd, The Priory, Pittenweem, Fife.
 C. Thomas Hunter, Ardoch, Thornhill.

CLASS 26. PLYMOUTH ROCK. Hen.

- 1st. John Russell, Troquhain, New Galloway.
 2d. Rev. Fitzroy Lloyd, The Priory, Pittenweem, Fife.
 C. Leonard Pilkington, Cavens, Dumfries.

CLASS 27. PLYMOUTH ROCK. Cockerel.

- 1st. L. H. & J. Nutter, Croft House, Burton, Westmoreland.
 2d. Leonard Pilkington, Cavens, Dumfries.
 C. Rev. Fitzroy Lloyd, The Priory, Pittenweem, Fife.

CLASS 28. PLYMOUTH ROCK. Pullet.

- 1st. L. H. & J. Nutter, Croft House, Burton, Westmoreland.
 2d. David L. Picken, Milton, Kirkcubright.

CLASS 29. MINORCA. Cock.

- 1st. James Watson, Caldwellside, Lanark.
 2d. J. M'D. Beattie, Llangerniew, Abergelle, North Wales.

CLASS 30. MINORCA. Hen.

- 1st. William Gass, 27 Scott Street, Annan.
- 2d. Misses Matilda and Aime Kerwan, The Forrest, Castle-Douglas.

CLASS 31. MINORCA. Cockerel.

- 1st. William Jack, Main Street, West Kilbride.
- 2d. Charles Walker, 7 Bruce Street, Dundee.

CLASS 32. MINORCA. Pullet.

- 1st. William Jack, Main Street, West Kilbride.
- 2d. John W. Crossman, The Shrubberies, Galphay, Ripon, York-shire.

CLASS 33. LEGHORN. Cock.

- 1st. Brown Brothers, Woodhill Farm, Kilmaurs.

CLASS 34. LEGHORN. Hen.

- 1st. Laurence Anderson, 9 Reform Street, Dunfermline.

CLASS 35. LEGHORN. Cockerel.

- 1st. Thomas Harrow, jun., Stewartville, Dysart, Fife.
- 2d. Robert Pullar, 65 Peddie Street, Dundee.
- C. James Gordon, Gas Works, Armadale.

CLASS 36. LEGHORN. Pullet.

- 1st. Robert Pullar, 65 Peddie Street, Dundee.
- 2d. W. Jamieson, 50 David's Loan, Bainsford, Falkirk.
- C. T. Smith, Bainsford, Falkirk.

CLASS 37. LANGSHAN. Cock.

- st. Robert Matthews, Cargenholm, Dumfries.
- nd. F. Joynson, Murraythwaite, Ecclefechan.

CLASS 38. LANGSHAN. Hen.

- st. Robert Matthews, Cargenholm, Dumfries.
- d F. Joynson, Murraythwaite, Ecclefechan.

CLASS 39. LANGSHAN. Cockerel.

- st. F. Joynson, Murraythwaite, Ecclefechan.
- d. John Lindsay, Leven Road, Windygates, Fife.

CLASS 40. LANGSHAN. Pullet—*Not forward.*

CLASS 41. WYANDOTTE. Cock.

- st. Henry Maidment, Lanercost, Brampton, Cumberland.
- l. C. G. Meldrum, Manse of Logierait, Ballinluig.
- . Miss Matilda E. Maxwell, Terraughtie, Dumfries.

CLASS 42. WYANDOTTE. Hen.

- t. Henry Maidment, Lanercost, Brampton, Cumberland.
- l. Miss Matilda E. Maxwell, Terraughtie, Dumfries.

CLASS 43. WYANDOTTE. Cockerel.

- t. T. & W. Hope, Banks, Brampton, Cumberland.
- . David Reid, Arthuret, Longtown, Cumberland.
- Henry Maidment, Lanercost, Brampton, Cumberland.

CLASS 44. WYANDOTTE. Pullet.

- . David Reid, Arthuret, Longtown, Cumberland.
- . T. & W. Hope, Banks, Brampton, Cumberland.
- Henry Maidment, Lanercost, Brampton, Cumberland.

CLASS 45. Any other Pure Breed. Cock.

- 1st. J. A. Mather, Grovehill, Thornhill (Indian Game).
 2d. Dr Richmond, 57 Love Street, Paisley.

CLASS 46. Any other Pure Breed. Hen.

- 1st. J. A. Mather, Grovehill, Thornhill (Indian Game).
 2d. Mrs D. Mackenzie, Maryfield, Meigle (Spanish).
 C. David L. Picken, Milton, Kirkcudbright.

CLASS 47. Any other Pure Breed. Cockerel—*No Entry*.CLASS 48. Any other Pure Breed. Pullet—*No Entry*.

CLASS 49. GAME—Black or Brown Reds. Cock.

- 1st. J. A. Mather, Grovehill, Thornhill.
 2d. Leonard Pilkington, Cavens, Dumfries.
 C. Robert Scott, 56 Dundee Road, Forfar.

CLASS 50. GAME—Black or Brown Reds. Hen.

- 1st. Leonard Pilkington, Cavens, Dumfries.
 2d. Leonard Pilkington, Cavens, Dumfries.
 C. J. A. Mather, Grovehill, Thornhill.

CLASS 51. GAME—Black or Brown Reds. Cockerel.

- 1st. Leonard Pilkington, Cavens, Dumfries.

CLASS 52. GAME—Black or Brown Reds. Pullet.

- 1st. Leonard Pilkington, Cavens, Dumfries.
 2d. William Buchanan, Kilbarchan, Renfrewshire.

CLASS 53. GAME—Any other Pure Breed. Cock.

- 1st. J. A. Mather, Grovehill, Thornhill (Game).
 2d. John Sneddon, Beechbank, Ratho Station (Duckwing).

CLASS 54. GAME—Any other Pure Breed. Hen.

- 1st. John Sneddon, Beechbank, Ratho Station (Duckwing).
 2d. J. A. Mather, Grovehill, Thornhill (Game).

CLASS 55. GAME—Any other Pure Breed. Cockerel.

- 1st. John Sneddon, Beechbank, Ratho Station (Duckwing).

CLASS 56. GAME—Any other Pure Breed. Pullet.

- 1st. John Sneddon, Beechbank, Ratho Station (Duckwing).

CLASS 57. BANTAM—Any Pure Breed. Cock.

- 1st. John Sneddon, Beechbank, Ratho Station (Black-red).
 2d. Edwin Mather, Grovehill, Thornhill (Bantam).
 C. Dr Richmond, 57 Love Street, Paisley.

CLASS 58. BANTAM—Any Pure Breed. Hen.

- 1st. David L. Picken, Milton, Kirkcudbright.
 2d. Edwin Mather, Grovehill, Thornhill (Bantam).
 C. John Sneddon, Beechbank, Ratho Station (Black-red).

CLASS 59. BANTAM—Any Pure Breed. Cockerel.

- 1st. R. Irving, Milton, Carlisle (Game).
 2d. John Sneddon, Beechbank, Ratho Station (Black-red).

CLASS 60. BANTAM—Any Pure Breed. Pullet.

- 1st. John Sneddon, Beechbank, Ratho Station (Black-red).
 2d. R. Irving, Milton, Carlisle (Game).
 C. Matthew Smith, Towuhead Farm, Thornhill (Scotch Grey).

CLASS 61. DUCKS—White Aylesbury. Drake.

- 1st. John Gillies, Edington Mills, Chirnside.
- 2d. John Gillies, Edington Mills, Chirnside.
- C. Miss Blackburn, Killearn, Glasgow.

CLASS 62. DUCKS—White Aylesbury. Duck.

- 1st. John Gillies, Edington Mills, Chirnside.
- 2d. John Gillies, Edington Mills, Chirnside.
- C. J. Stewart Lyon, Kirkmichael, Dumfries.

CLASS 63. DUCKS—White Aylesbury. Drake (Young).

- 1st. Thomas Scott, South Woodend, Bonnybridge.
- 2d. John Gillies, Edington Mills, Chirnside.
- C. John Gillies, Edington Mills, Chirnside.

CLASS 64. DUCKS—White Aylesbury. Duckling.

- 1st. Thomas Scott, South Woodend, Bonnybridge.
- 2d. John Gillies, Edington Mills, Chirnside.
- C. C. G. Meldrum, Manse of Logierait, Ballinluig.

CLASS 65. DUCKS—Rouen. Drake.

- 1st. James Dow, Clathybeg, Auchterarder.
- 2d. Lady Wilson, Chillingham Barns, Belford, Northumberland.
- C. Thomas Scott, South Woodend, Bonnybridge.

CLASS 66. DUCKS—Rouen. Duck.

- 1st. Stuart Mather, Grovehill, Thornhill.
- 2d. Stuart Mather, Grovehill, Thornhill.
- C. David L. Picken, Milton, Kirkcudbright.

CLASS 67. DUCKS—Rouen. Drake (Young).

- 1st. Thomas Scott, South Woodend, Bonnybridge.
- 2d. David L. Picken, Milton, Kirkcudbright.

CLASS 68. DUCKS—Rouen. Duckling.

- 1st. Thomas Scott, South Woodend, Bonnybridge.
- 2d. David L. Picken, Milton, Kirkcudbright.

CLASS 69. DUCKS—Any other Pure Breed. Drake.

- 1st. Lady Wilson, Chillingham Barns, Belford, Northumberland (Cayuga)
- 2d. James R. W. Wallace, Auchenbrack, Thornhill.

CLASS 70. DUCKS—Any other Pure Breed. Duck.

- 1st. Lady Wilson, Chillingham Barns, Belford, Northumberland (Cayuga).

CLASS 71. DUCKS—Any other Pure Breed. Drake (Young)—*No Entry.*CLASS 72. DUCKS—Any other Pure Breed. Duckling—*No Entry.*

CLASS 73. TURKEYS—Any Pure Breed. Cock.

- 1st. C. G. Meldrum, Manse of Logierait, Ballinluig (American Bronze).
- 2d. Lady Wilson, Chillingham Barns, Belford, Northumberland (Bronze).
- C. James Dow, Clathybeg, Auchterarder (Bronze).

CLASS 74. TURKEYS—Any Pure Breed. Hen.

- 1st. Lady Wilson, Chillingham Barns, Belford, Northumberland (Bronze).
- 2d. Thomas Scott, South Woodend, Bonnybridge.
- C. G. J. Fergusson-Buchanan, Auchentorlie, Bowling (Bronze).

CLASS 75. TURKEYS—Any Pure Breed. Cock (Poult).

- 1st. George Alexander Bell, Downfield, Ladybank (American Bronze).
- 2d. Mrs Wilson, Muirhead of Pitcullo, Cupar-Fife (American Bronze).

CLASS 76. TURKEYS—Any Pure Breed. Hen (Poult).

- 1st. George Alexander Bell, Downfield, Ladybank (American Bronze).
 2d. Mrs Wilson, Murhead of Pitcullo, Cupar-Fife (American Bronze).

CLASS 77. GEESE—Any Pure Breed. Gander.

- 1st. David L. Picken, Milton, Kirkcudbright.
 2d. James Dow, Clathybeg, Auchterarder (Ebdon).
 C. John Kerr, jun., Red Hall, Wigton, Cumberland (Toulouse).

CLASS 78. GEESE—Any Pure Breed. Goose.

- 1st. Thomas Scott, South Woodend, Bonnybridge.
 2d. James Dow, Clathybeg, Auchterarder (Ebdon).
 C. H. C. Irving, Burnfoot, Ecclefechan (Toulouse).

CLASS 79. GEESE—Any Pure Breed. Gander (Young).

- 1st. Thomas Scott, South Woodend, Bonnybridge.
 2d. David L. Picken, Milton, Kirkcudbright.

CLASS 80. GEESE—Any Pure Breed. Gosling.

- 1st. Thomas Scott, South Woodend, Bonnybridge.
 2d. David L. Picken, Milton, Kirkcudbright.

DAIRY PRODUCE

CLASS 1. CURED BUTTER, not less than 7 lb.—Premiums, £4, £2, and £1.

- 1st. William Whyte, Middlepenny, Langbank.
 2d. Henry Orr, Torrance Farm, West Craigs, Linlithgowshire.
 3d. Robert Gilmour, Stonebyres, Eaglesham.
 V.H.C. William Duncan, Middlerigg, Polmont Station.
 H.C. Mrs Cullen, Woodend, Airdrie.
 C. William Paterson, Barnego, Denny.

CLASS 2. POWDERED BUTTER, not less than 7 lb.—Premiums, £4, £2, and £1.

- 1st. Robert Gilmour, Stonebyres, Eaglesham.
 2d. William Whyte, Middlepenny, Langbank.
 3d. Henry Orr, Torrance Farm, West Craigs, Linlithgowshire.
 V.H.C. Mrs Cullen, Woodend, Airdrie.
 H.C. George Wallace, Kinglass Farm, Bo'ness.
 C. William Duncan, Middlerigg, Polmont Station.

CLASS 3. FRESH BUTTER, Three 1-lb. Rolls.—Premiums, £4, £2, and £1.

- 1st. Henry Orr, Torrance Farm, West Craigs, Linlithgowshire.
 2d. Robert Gilmour, Stonebyres, Eaglesham.
 3d. David Longwill, Kendieshill, Linlithgow.
 V.H.C. George Wallace, Kinglass Farm, Bo'ness.
 H.C. William Paterson, Barnego, Denny.
 C. Mrs Cullen, Woodend, Airdrie.

CLASS 4. CHEDDAR CHEESE, 56 lb. and upwards.—Premiums,
£12, £9, £7, £5, £4, £2, and £1.

- 1st. Alexander Cross of Knockdon, Maybole.
 2d. Matthew Templeton, Dromor Farm, Kirkcudbright.
 3d. Hugh M'Clymont, Balgowan, Ardwell, Kirkmaiden.
 4th. William M'Master, Challock, Dunragit.
 5th. John M'Camon, Kirranrae, Stranraer.
 6th. Graham Hutchison, Campdouglass Farm, Castle-Douglas.
 7th. John Cruickshank, Ingleston, Borgue, Kirkcudbright.
 V.H.C. J. C. Cunningham, Dunragit Home Farm, Glenluce.
 H.C. James Cruickshank, Upper Senwick, Borgue, Kirkcudbright.
 C. John M'Camon, Barnhills, Stranraer.

CLASS 5. SWEET-MILK CHEESE, flat shape, white in colour, made according to the Dunlop or other method.—Premiums, £6, £4, £2, £1.

- 1st. James R. W. Wallace, Auchinbrack, Thornhill.
- 2d. Alexander Cross, Knockdon, Maybole.
- 3d. John Drummond, Camiscean, Craigie, Kilmarnock.
- 4th. Robert Montgomerie, Lessnessock, Ochiltree.
- V.H.C. Hugh M'Clymont, Balgowan, Ardwell, Kirkmaiden.
- H.C. Robert Pickin, Langside, Craigie, Kilmarnock.
- C. James Hood, Dormiston, Coylton.

HORSE-SHOEING

(Prizes given by Sir James H. Gibson-Craig, Bart.)

OPEN TO SHOEING-SMITHS FROM ANY PART OF THE UNITED KINGDOM.

Thursday, 25th July.

CLASS 1. DRAUGHT HORSES.—Premiums, £3, £2, and £1.

- 1st. Alexander Allan, Clarkston, Busby, by Glasgow.
- 2d. Robert Muir, Sandyford, Monkton, Ayrshire.
- 3d. William Muir, Fiveways, Hurlford, Ayrshire.
- V.H.C. George Reid, Baird's Land, Baillieston.
- H.C. Edward Griffiths, Eamont Bridge, Penrith, Cumberland.
- C. Edward Martin, jun., Closeburn Village, Thornhill.

Friday, 26th July.

CLASS 2. ROADSTERS.—Premiums, £3, £2, and £1.

- 1st. Alexander Allan, Clarkston, Busby, by Glasgow.
- 2d. Thomas Martin, Closeburn Village, Thornhill.
- 3d. John Kennedy, Howard Arms Yard, Brompton, Cumberland.
- V.H.C. Edward Martin, jun., Closeburn Village, Thornhill.
- H.C. Wm. M'Caa, Garrallan Smithy, Old Cumnock.
- C. John Marshall, Gateside, Beith.

JUDGES.

SHORTHORN.—A. M. Gordon of Newton, Inch, Aberdeenshire; William Alexander, Loanside, Clackmannan.

ABERDEEN-ANGUS.—Robert Walker, Altyre, Forres; Arch. Whyte, Inverquharity, Kirriemuir.

GALLOWAY.—John M'Turk, Bridge of Dee, Castle-Douglas; A. M'Conchie, Mains of Penninghame, Newton-Stewart; Jonathan Holliday, Kirkbampton, Carlisle.

HIGHLAND.—Robert Allan, Kames, Glenmore, Lochgilphead.

AYRSHIRE.—James M'Alister, Meikle Kilmory, Rothesay; James Howie, jun., Hillhouse, Kilmarnock.

STALLIONS, ENTIRE COLTS, AND DRAUGHT GELDINGS.—W. H. Ralston, Culmore, Stranraer; Robert M'Alister, Mid-Ascog, Rothesay.

MARES AND FILLIES.—Thos. Kennedy, Glenhead, Uplawmoor; Thos. Kerr, Kirkchrist, Kirkcudbright.

HUNTERS AND ROADSTERS.—R. A. Oswald of Auchencruive, Ayr; Colonel D. R. Williams of Lawers, Crieff.

HACKNEYS.—R. G. Heaton, Ferryhill, Chatteris, Cambs.

PONIES.—James Hamilton, 56 Wilson Street Glasgow.

SHEETLAND PONIES.—D. Shepherd, Hardiesmill Place, Kelso.

BLACKFACED.—James Allan, jun., Balnacool, Shiskine, Arran; Alexander Cowan, Spittalhill, Finty.

CHEVIOT.—William Mitchell, Ribigill, Tongue, Sutherlandshire; George Douglas, Upper Hindhope, Jedburgh.

BORDER LEICESTER.—Andrew Wood, Brocksbushes, Corbridge; William Bain, Legars, Kelso.

SHERPESHIRE.—T. S. Minton, Montford, Shrewsbury.

HALF-BRED.—Andrew Smith, Longniddry.

FAT SHEEP.—J. Armstrong, Palmerston House, Dumfries.

POULTRY.—W. Isherwood, Haddo House, Aberdeen.

CHEESE.—Hugh Osborne, Candleriggs, Glasgow.

BUTTER.—R. J. Drummond, Kilmarnock.

HORSE-SHOEING.—Professor M'Call, Veterinary College, 83 Buccleuch Street, Glasgow.

ATTENDING MEMBERS.

SHORTHORN.—C. M. Cameron, Balnakyle; John M'Kie, Ernespie; J. W. J. Paterson, Terrona; Thos. M'Lelland, North Balfarn.

ABERDEEN-ANGUS.—Robert Paterson, Hill of Drip; A. M'Ilwrick, Quarter; James Lindsay, Whitcastle; James Biggar, Grange Farm.

GALLOWAY.—Thomas C. Greig, Rephad; John Kerr, Blountfield; W. R. Farish, Tinwald Parks.

HIGHLAND.—Sir Robert Menzies of Menzies, Bart.; James Cunningham, Tarbreoch; W. Stewart of Shambellie.

AYRESHIRE.—W. T. Malcolm, Dunmore; James Hope, East Barnes; James Moffat, Gateside; Geo. Cowan, Mains of Park.

STALLIONS AND ENTIRE COLTS AND DRAUGHT GELDINGS.—R. Sinclair Scott, Burnside; Captain Clayhills Henderson of Invergowie, R.N.; C. H. Maxwell, Dalruskin; W. A. M'Turk, Barlae; John M'Caig, Challock.

MARES AND FILLIES.—W. J. Maxwell, yr. of Munches; George Dun, Easter Kincaide; R. Smith, Dalbible; T. K. Newbigging, Dumfries.

HUNTERS AND ROADSTERS.—Wellwood Maxwell of Kirkennan; H. C. Irving of Burnfoot; Abram Kerr, Sycamore; James Wylie, Edinburgh.

HACKNEYS.—David Wilson, yr. of Carbeth; J. L. Drew, Dranandow; T. A. Cliff, Mabie; W. J. Maxwell, Terregles Banks, Dumfries.

PONIES.—Andrew Hutcheson, Beechwood; Hon. W. J. Hewitt, Gatehouse; M. Johnstone, Archbank.

SHEETLAND PONIES.—John Cran, Kirkton; Bailie Glover, Dumfries; Bailie Scott, Dumfries; James A. Caird of Cassenary.

BLACKFACED.—W. H. Lumsden of Balmedie; John Wilson, Chapelhill; Walter Connell of Auchencheyne; John M'Camon, Kirkholm.

CHEVIOT.—David Kirkpatrick, Townfoot; J. R. W. Wallace, Anchenbrack; John Parlane, Craigdhu.

BORDER LEICESTER.—John M. Aitken, Norwood; John M'Dowall, Girdstingwood; A. J. M'Intosh, Dumfries.

SHERPESHIRE.—Bailie Farries, Dumfries; Dean Currie, Dumfries.

HALF-BRED.—William Marshall, Lochfergus; S. T. Farish, Kirkland.

FAT SHEEP.—Alex. Cross of Knockdon; W. T. Sproat, Bogue House.

POULTRY.—R. Adamson, Dumfries.

CHEESE.—James Lockhart, Mains of Airies; John Ghieson, Town-Clerk, Dumfries; Treasurer Hiddleston, Dumfries.

BUTTER.—W. M. Wright, Dumfries.

HORSE-SHOEING.—Sir James H. Gibson-Craig of Riccarton, Bart.; John Marr, Cairnbrogie; David Kirkpatrick, Townfoot.

II.—DISTRICT COMPETITIONS.

CATTLE, HORSES, AND SHEEP.

| NAME OF DIST. | PREMIUM AWARDED TO | FOR | AMOUNT. |
|--|---|-------------------------------------|---------|
| <i>Spey, Aven, and Fiddochside</i> | George Cowie, Pitglassie | Shorthorn Bull . . . | £2 0 0 |
| | Mrs Kinloch Grant of Arndilly | do. . . . | 1 0 0 |
| | Col. George Smith Grant, Auchorachan | Aberdeen-Angus Bull . . . | 2 0 0 |
| | J. R. Findlay of Aberlour | do. do. . . . | 1 0 0 |
| | Sir Geo. Macpherson Grant of Ballindalloch, Bart. | Clydesdale Mare . . . | 2 0 0 |
| | Col. John Gordon Smith of Delnabo | do. Filly | 1 0 0 |
| | James Shiach, Wardhead | Blackfaced Gimmers . . . | 1 0 0 |
| | John Black, Fenar | do. . . . | 0 10 0 |
| | James Sutor, Collie | Leicester Tup | 1 0 0 |
| | Jas. M'William, Stoneytown | do. . . . | 0 10 0 |
| <i>Jed-Forest</i> | David Dunn, Roxburgh Mains | Clydesdale Mare | 3 0 0 |
| | J. A. W. Mein of Hunthill | Shorthorn Cow | 2 0 0 |
| | Earl of Minto, Minto House | do. . . . | 1 0 0 |
| | J. A. W. Mein of Hunthill | Half-bred Tup | 2 0 0 |
| | Wm. Simson, Bedrule | do. . . . | 1 0 0 |
| | Walter Little, Peelanie | Cheviot Sheep | 3 0 0 |
| <i>Central Banffshire</i> | Col. J. G. Smith, Minmore | Shorthorn Bull | 1 10 0 |
| | Jas. M'William, Stoneytown | do. Heifer | 1 10 0 |
| | Col. George Smith Grant, Auchorachan | Polled Angus Bull . . . | 1 10 0 |
| | Robert Forbes, Woodhead | do. Cow | 1 10 0 |
| | Alex. M'G. Mennie, Brawland Knowes | Clydesdale Mare | 1 10 0 |
| | Countess of Seafield, Cullen House | do. Filly | 1 10 0 |
| | Jas. M'William, Stoneytown | Leicester Tup | 1 0 0 |
| | John Cran, Keith | Cheviot Ewes | 1 0 0 |
| <i>Strathspey</i> | William Wilson, Coynachie | Blackfaced Tup | 1 0 0 |
| | D. G. Lawson, Achmagallan | Polled Angus Bull . . . | 2 10 0 |
| | Countess of Seafield, Castle Grant | Highland Cow | 2 10 0 |
| | John Macdonald, Toremore | Draught Mare | 2 10 0 |
| | Capt. Macdonald, Granttown | Shetland Mare | 2 10 0 |
| | Donald Grant, Lynemore | Blackfaced Tup | 2 0 0 |
| <i>West Linton</i> | A. J. K. Smith, Longniddry | Leicester Tup | 2 0 0 |
| | R. G. Murray, Spittal | do. . . . | 1 0 0 |
| | A. J. K. Smith, Longniddry | Leicester Shearling Tup . . . | 2 0 0 |
| | A. J. K. Smith, Longniddry | do. do. . . . | 1 0 0 |
| | A. J. K. Smith, Longniddry | Leicester Ewes | 2 0 0 |
| | A. J. K. Smith, Longniddry | do. . . . | 1 0 0 |
| | A. J. K. Smith, Longniddry | Leicester Gimmers | 2 0 0 |
| | A. J. K. Smith, Longniddry | do. . . . | 1 0 0 |
| <i>Islay, Jura, and Colonsay</i> | H. & R. Hunter, Elenyadale | Highland Bull | 1 0 0 |
| | Charles Morrison of Islay | do. Cow | 1 0 0 |
| | Samuel Mitchell, Neriby | do. Heifer | 1 0 0 |
| | A. S. & J. Clark, Sunderland | Ayrshire Bull, aged | 1 0 0 |
| | A. S. & J. Clark, Sunderland | do. two-year-old | 1 0 0 |
| | Allan M'Dougall, Port Ellen | do. . . . | 0 15 0 |
| | Allan M'Dougall, Port Ellen | Ayrshire Heifer, two-year-old . . . | 0 15 0 |
| | Allan M'Dougall, Port Ellen | do. one-year-old | 0 15 0 |

Carry forward . £67 5 0

| NAME OF DIST | PREMIUM AWARDED TO | FOR | AMOUNT. |
|-----------------------|--------------------------------|---------------------------------------|--------------|
| | | Brought forward | £67 5 0 |
| <i>Islay, Jura,</i> | A. S. & J. Clark, Sunderland | Clydesdale Mare . . . | 1 0 0 |
| <i>and Colon-</i> | John Dunn, Erminart | do. Filly . . . | 1 0 0 |
| <i>say—contd.</i> | A. S. & J. Clark, Sunderland | do. Gelding . . . | 1 0 0 |
| | Robert Cullen, Bridgend | Roadster Mare . . . | 1 0 0 |
| | Robert Cullen, Bridgend | do. two-year-old . . . | 0 15 0 |
| <i>West Terri-</i> | Walter Elliot, Hollybush | Cheviot Tup . . . | 2 0 0 |
| <i>dale</i> | James Moffat, Craick | do. | 1 0 0 |
| | James Moffat, Craick | Cheviot Shearling Tup . . . | 1 0 0 |
| | James Moffat, Craick | do. do. . . . | 0 10 0 |
| | T. Scott Anderson, Ettrick | } Cheviot Ewes . . . | 1 0 0 |
| | Shaws | | |
| | James Moffat, Craick | do. | 0 10 0 |
| | James Moffat, Craick | Cheviot Gimmers . . . | 2 0 0 |
| | W. & J. Paterson, Wauchope | do. | 1 0 0 |
| <i>Kincardine-</i> | D. K. Stephen, Commieston | Aberdeen-Angus Bull . . . | 3 0 0 |
| <i>shire</i> | James Milne, jun., Cairnhill | Shorthorn Bull . . . | 3 0 0 |
| | Wm. Fraser, Kilnhill | Draught Filly . . . | 3 0 0 |
| | Jas. Reid, Nether Tulloch | do. Mare . . . | 3 0 0 |
| <i>Aberdour</i> | For Pure-bred Stock . . . | | 12 0 0 |
| <i>Vale of Alford</i> | John Reid, Balquharn | Aberdeen-Angus Bull . . . | 2 0 0 |
| | T. N. Cook, Dorsell | do. do. . . . | 2 0 0 |
| | A. Strachan, Wester Fowlis | Aberdeen-Angus Heifer . . . | 2 0 0 |
| | G. Wilken, Waterside of Forbes | do. do. . . . | 2 0 0 |
| | Wm. Benton, Harthill | Two-year-old Shorthorn Bull . . . | 1 0 0 |
| | Wm. Benton, Harthill | One-year-old do. . . . | 1 0 0 |
| | Wm. A. Mitchell, Auchna- | } Two-year-old Shorthorn Heifer . . . | 1 0 0 |
| | gathle | | |
| | Wm. A. Mitchell, Auchna- | } One-year-old do. . . . | 1 0 0 |
| | gathle | | |
| <i>Caithness</i> | William Moore, Ormlie | Draught Mare . . . | 2 0 0 |
| | David S. W. M'Adie, Kirk | } Two-year-old Filly . . . | 2 0 0 |
| | Mains | | |
| | James Sutherland, Waterloo | One-year-old do. . . . | 1 0 0 |
| | Alex. Sinclair, Quoys of Reiss | Shorthorn Bull . . . | 2 0 0 |
| | Donald Innes, Sandside | Aberdeen-Angus Bull . . . | 2 0 0 |
| | Geo. Brown, Watten Mains | Leicester Tup . . . | 2 0 0 |
| | Alex. Sinclair, Quoys of Reiss | Cheviot Tup . . . | 1 0 0 |
| <i>Dalkeith</i> | William Park, Brunstane | Brood Mare . . . | 4 0 0 |
| | Lothian Coal Co., Ltd., | } do. | 2 0 0 |
| | Lingerwood | | |
| | John Stoddart, Redmains | Three-year-old Filly . . . | 2 0 0 |
| | Thomas Lean, Wester Deans | Two-year-old do. . . . | 2 0 0 |
| | B. Stuart, Hareus | One-year-old do. . . . | 2 0 0 |
| <i>Black Isle</i> | J. D. Fletcher of Rosehaugh | Shorthorn Bull . . . | 2 0 0 |
| | C. M. Cameron, Balnakyle | do. Heifer . . . | 2 0 0 |
| | J. D. Fletcher of Rosehaugh | Clydesdale Stallion . . . | 2 0 0 |
| | J. D. Fletcher of Rosehaugh | do. Mare . . . | 2 0 0 |
| | J. D. Fletcher of Rosehaugh | Clydesdale Filly . . . | 2 0 0 |
| | Archd. Cameron, Killen | Leicester Tup . . . | 1 0 0 |
| | J. D. Fletcher of Rosehaugh | do. Gimmers . . . | 1 0 0 |
| <i>Argyll</i> | Archd. Turner, Kilchamaig | Highland Bull . . . | Silver Medal |
| | B. & J. Mundell, Achna- | } Ayrshire do. . . . | do. |
| | carnan | | |
| | Wm. Maxwell, Barascomel | Clydesdale Mare . . . | do. |
| <i>Curriek</i> | Alex. Cross of Knockdon | Leicester Tup . . . | do. |
| | Alex. Cross of Knockdon | Ayrshire Cow . . . | do. |
| | Wm. Kerr, Houdston | Clydesdale Filly . . . | do. |

Carry forward £153 0 0

| NAME OF DIST. | PREMIUM AWARDED TO | FOR | AMOUNT. |
|-------------------|---|-------------------------|--------------|
| | | Brought forward | £153 0 0 |
| <i>Morayshire</i> | A. W. Law, Sanquhar Mains | Shorthorn Heifer | Silver Medal |
| | Jas. M'William, Stoneytown | Leicester Shearling Tup | do. |
| | Ernest Mathieson, Elgin | Yorkshire Sow | do. |
| <i>Kinglassie</i> | J. & W. Meiklem, Begg | Clydesdale Mare | do. |
| | J. & W. Meiklem, Begg | Aberdeen-Angus Bull | do. |
| | J. & W. Meiklem, Begg | Leicester Tup | do. |
| <i>Forth</i> | G. P. Somerville, Muirhouse | Clydesdale Filly | do. |
| | John Lawson, Guildhouse | Ayrshire Cow | do. |
| | James Hamilton, Woolfords | Blackfaced Tup | do. |
| <i>Weem</i> | Charles Munro, Mains of } Murthly | Shorthorn Cow | do. |
| | Peter M'Callum, Dunkeld | Blackfaced Tup | do. |
| | Sir Robert Menzies of } Menzies, Bart. | Aberdeen-Angus Bull | do. |
| <i>Nairnshire</i> | Walter S. Park, Hatton | Stallion | 15 0 0 |
| <i>Speyside</i> | Sir Geo. Macpherson Grant } of Ballindalloch, Bart., } and others | Stallion | 15 0 0 |
| <i>Turriff</i> | Walter S. Park, Hatton | Stallion | 15 0 0 |
| <i>Kelso</i> | Andrew Montgomery, } Netherhall | Stallion | 15 0 0 |
| | | | £213 0 0 |
| | 18 Minor Silver Medals | | 4 16 0 |
| | | | £217 16 0 |

SPECIAL GRANTS.

| | | | |
|--|----------------------------------|-------|---------|
| <i>Highland Home Industries and Arts Association</i> | Grant | . . . | £40 0 0 |
| <i>Ayrshire Agricultural Association</i> | Vote to Dairy Show at Kilmarnock | . . . | 20 0 0 |
| <i>Shetland Agricultural Society</i> | Vote in aid of Premiums | . . . | 5 0 0 |
| <i>Orkney Agricultural Society</i> | do. | . . . | 3 0 0 |
| <i>South Uist and Barra</i> | do. | . . . | 3 0 0 |
| | | | £71 0 0 |

MEDALS IN AID OF PREMIUMS GIVEN BY LOCAL SOCIETIES.

Minor Silver Medals were awarded to the following:—

ABERDEENSHIRE.

| NAME OF DIST. | SILVER MEDAL AWARDED TO | FOR |
|------------------------------------|--|---|
| <i>Cluny, Monymusk, and Midmar</i> | Francis Murray, Nether Sauchen William Connon, Nether Coullie | Aberdeen-Angus Bull Clydesdale Filly |

ARGYLLSHIRE.

| | | |
|---------------|--|-------------------------------|
| <i>Dunoon</i> | Archibald Mercer, Auchamore Neil Nicholson, Auchgoyle | Ayrshire Bull Ayrshire Cow |
|---------------|--|-------------------------------|

AYRSHIRE.

| NAME OF DIST. | SILVER MEDAL AWARDED TO | IOR |
|--|--------------------------------|---------------------|
| <i>Doltrymple</i> | Robert Paton, Trees Farm | Ayrshire Cow |
| | William Richmond, Laigh Grange | Clydesdale Stallion |
| <i>Girvan</i> | James Wilson, Macherquhat | Ayrshire Cow |
| | William Kerr, Houdston | Clydesdale Mare |
| <i>Monkton, Prestwick, Newton, &c.</i> | J. A. Campbell of Craigie | Clydesdale Mare |
| | T. C. Lindsay, Aikenbrae | Ayrshire Cow |
| <i>West Kilbride</i> | Mrs T. Brown, Fences | Brood Mare |
| | William Kean, Chapelton | Ayrshire Cow |

BERWICKSHIRE.

| | | |
|----------------------------------|-------------------------------|------------------------|
| <i>Lauderdale Beekeepers</i> | George Moffat, Gordon | Non-Sectional Super |
| <i>Lauderdale Ornithological</i> | Robert Craw, Wester Lodge | Leghorn Cock and Hen |
| | Miss J. Rutherford, Legerwood | Black-red Game Bantams |

DUMFRIESSHIRE.

| | | |
|--|-----------------------------|-------------------|
| <i>Moffat and Upper Annandale</i> | John A. Johnstone, Archbank | Cheviot Tup |
| | D. B. Richardson, Haregills | Clydesdale Mare |
| <i>South of Scotland Beekeeper's Association</i> | Ross & Kerr, Dumfries | Honey in Sections |
| | Ross & Kerr, Dumfries | Honey in Bottles |

FIFESHIRE.

| | | |
|---------------------------------|----------------------------|------------------|
| <i>Western District of Fife</i> | James Tulloch, Dales | Leicester Ewes |
| | J. & W. Meiklem, Begg Farm | Clydesdale Filly |

HADDINGTONSHIRE.

| | | |
|----------------------------|--------------------------------|-----------------|
| <i>United East Lothian</i> | A. & J. K. Smith, Thorlieshope | Cheviot Gimmers |
| | Hugh Andrew, Lennoxlove | Clydesdale Colt |

KIRKCUDBRIGHTSHIRE.

| | | |
|-------------------|--------------------------------------|-----------------|
| <i>Carsphairn</i> | Messrs M'Millan, Holm of Dalquahairn | Blackfaced Tup |
| | Miss M. Brown, Carsphairn | Powdered Butter |

LANARKSHIRE.

| | | |
|---------------------------------|------------------------------|---------------------|
| <i>Carmichael</i> | John Findlay, Warrenhill | Blackfaced Tup |
| | William Adamson, Devonside | Hamburg Hen |
| <i>Shettleston and Chryston</i> | John Anderson, Middlequarter | Ayrshire Cow |
| | John Anderson, Middlequarter | Clydesdale Geldings |

NAIRNSHIRE.

| | | |
|----------------------------------|--------------------------------|--------------------|
| <i>Nairnshire Ornithological</i> | Alexander Kinnaird, Cawdor | Silver Dorking Hen |
| | Alexander Fraser, White Bridge | Aylesbury Drake |

PEEBLESHIRE.

| | | |
|------------------------|-------------------------|----------------|
| <i>Upper Tweedside</i> | S. Brown, Glencotho | Blackfaced Tup |
| | T. Todd, Kilbucko Mains | Cheviot Tup |

ROSS-SHIRE.

| | | |
|--------------------------|------------------------------|-----------------------|
| <i>Northern Pastoral</i> | John Robson, Bighouse | Aged Cheviot Tup |
| | Walter G. Mundell, Inverlaul | Cheviot Shearling Tup |

ROXBURGHSHIRE.

| | | |
|-------------------|---------------------------|-----------------|
| <i>Luddesdale</i> | James Crawford, Flosshend | Clydesdale Mare |
| | J. & G. Slack, Perterburn | Cheviot Ewes |

STIRLINGSHIRE.

| | | |
|------------------|-------------------------------|-----------------|
| <i>Slamannan</i> | Ebenezer Forrester, Dyke Farm | Ayrshire Cow |
| | Alexander Watt, Roughrigg | Clydesdale Mare |

39 Minor Silver Medals, £10, 8s.

PLOUGHING COMPETITIONS.

In 1894-95 the Society's Silver Medal was awarded at 114 Ploughing Competitions.

114 Minor Silver Medals, £30, 8s.

III.—COTTAGES AND GARDENS.

37 Minor Silver Medals £9 17 4

Building New Cottages.

W. D. Mackenzie of Farr Gold Medal

IV.—VETERINARY DEPARTMENT.

CLASS EXAMINATIONS—1895.

Silver Medals were awarded to the following:—

ROYAL (DICK) VETERINARY COLLEGE.

| | | | |
|-------------------|------------------------------------|------------------|----------------|
| W. E. Ison | Veterinary Medicine | J. J. R. Jackson | Senior Anatomy |
| W. E. Ison | Veterinary Obstetrics | W. Murgatroyd | Physiology |
| W. S. Worthington | Cattle Pathology & Meat Inspection | W. Tait | Chemistry |
| W. S. Worthington | Pathology | Adam Gibson | Botany |
| W. S. Worthington | Parasitology | A. C. Burton | Zoology |

NEW VETERINARY COLLEGE.

| | | | |
|---------------|---------------------------------|---------------|----------------|
| J. M'Phail | Veterinary Medicine and Surgery | J. Paul | Botany |
| J. Spreull | Cattle Pathology | G. J. Roberts | Chemistry |
| W. T. Jones | Physiology | G. J. Roberts | Junior Anatomy |
| J. B. Collyer | Senior Anatomy | T. Dick | Materia Medica |

GLASGOW VETERINARY COLLEGE.

| | | | |
|------------------|--|----------------|----------------|
| R. Armstrong | Veterinary Medicine & Surgery (Cattle) | R. G. Anderson | Senior Anatomy |
| R. K. Rutherford | Veterinary Medicine & Surgery (Horse) | R. G. Anderson | Physiology |
| William Roy | Materia Medica | C. W. MacKay | Junior Anatomy |
| James Dick | Morbid Anatomy & Pathology | C. W. MacKay | Chemistry |
| | | C. W. MacKay | Botany |
| | | C. W. MacKay | Zoology |

28 Large Silver Medals, £19, 12s.

V.—AGRICULTURAL CLASS, EDINBURGH UNIVERSITY.

| | | |
|---|-----------|----------------|
| Arthur Allsebrook, Wollaton, Nottingham | | £6 0 0 |
| Samuel Milligan, Hayfield, Dumfries | | 4 0 0 |
| | | <u>£10 0 0</u> |

ABSTRACT OF PREMIUMS.

| | | | |
|--|-------|-----|------|
| 1. DUMFRIES SHOW | £2081 | 4 | 6 |
| 2. DISTRICT SHOWS:— | | | |
| Stock | £217 | 16 | 0 |
| Special Grants | 71 | 0 | 0 |
| Local Societies—39 Medals | 10 | 8 | 0 |
| Ploughing Associations—114 Medals | 30 | 8 | 0 |
| | | 329 | 12 0 |
| 3. COTTAGES AND GARDENS—37 Minor Silver Medals, £9, 17s. 4d.; Building New Cottages—Gold Medal, £9 | | 18 | 17 4 |
| 4. VETERINARY DEPARTMENT—Medals to Students | | 19 | 12 0 |
| 5. AGRICULTURAL CLASS, EDINBURGH UNIVERSITY | | 10 | 0 0 |
| | £2459 | 5 | 10 |

STATE OF THE FUNDS

OF

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND

As at 30th NOVEMBER 1895.

| | | | | | | | | | |
|---|--|--|--|--|--|--|--|---------|------|
| I. HERITABLE BONDS— | | | | | | | | | |
| £1,300 at 4 per cent, £11,500 at 3½ per cent, £550 at 3½ per cent, £15,500 at 3¼ per cent | | | | | | | | | |
| | | | | | | | | £29,150 | 0 0 |
| II. DEBENTURE STOCKS— | | | | | | | | | |
| £4,250 North British Railway Company 3 per cent, at £111½ | | | | | | | | | |
| | | | | | | | | £4,722 | 16 3 |
| £2,727 Caledonian Railway Company 4 per cent, at £150½ | | | | | | | | | |
| | | | | | | | | 4,097 | 6 4 |
| £1,334 London and North-Western Railway Company 3 per cent, at £116½ | | | | | | | | | |
| | | | | | | | | 1,554 | 2 2 |
| | | | | | | | | 10,374 | 4 9 |
| III. BANK STOCKS— | | | | | | | | | |
| £6,407 7 8 Royal Bank of Scotland, at £223½ | | | | | | | | | |
| | | | | | | | | £14,320 | 10 0 |
| 2,218 16 5 Bank of England, at £325 | | | | | | | | | |
| | | | | | | | | 7,211 | 3 4 |
| 2,500 0 0 British Linen Company Bank, at £399 | | | | | | | | | |
| | | | | | | | | 9,975 | 0 0 |
| 1,741 13 4 Bank of Scotland, at £341 | | | | | | | | | |
| | | | | | | | | 5,939 | 1 9 |
| | | | | | | | | 37,445 | 15 1 |
| | | | | | | | | £12,867 | 17 5 |
| IV. ESTIMATED VALUE of Building, No. 3 George IV. Bridge | | | | | | | | | |
| | | | | | | | | 3,100 | 0 0 |
| V. ESTIMATED VALUE of Furniture, Paintings, Books, &c. | | | | | | | | | |
| | | | | | | | | 1,000 | 0 0 |
| VI. ARREARS OF MEMBERS' SUBSCRIPTIONS considered recoverable | | | | | | | | | |
| | | | | | | | | 106 | 12 0 |
| VII. BALANCE DUE BY ROYAL BANK OF SCOTLAND ON ACCOUNTS | | | | | | | | | |
| CURRENT, at 30th November 1895 | | | | | | | | | |
| | | | | | | | | 1,523 | 2 4 |
| | | | | | | | | £82,699 | 14 2 |
| VIII. TWEEDDALE MEDAL FUND— | | | | | | | | | |
| Heritable Bond, at 3¼ per cent | | | | | | | | | |
| | | | | | | | | £500 | 0 0 |

W. S. WALKER, *Treasurer.*

JAS. H. GIBSON-CRAIG, *Member of Finance Committee.*

WM. HOME COOK, C.A., *Auditor.*

EDINBURGH, 8th January 1896.

ABSTRACT of the ACCOUNTS of the HIGHLAND and

CHARGE.

| | | |
|---|--------------------|------------|
| 1. BALANCE due by Royal Bank of Scotland on Account Current at 30th November 1894 | £277 10 8 | |
| 2. ARREARS of Subscriptions outstanding at 30th Nov. 1894 | 470 19 6 | |
| Whereof due by Members who have compounded for life, and are thereby extinguished | £7 17 0 | |
| Sums ordered to be written off | 17 10 0 | |
| | <u>25 7 0</u> | 45 12 6 |
| 3 INTERESTS AND DIVIDENDS— | | |
| (1) Interest on Heritable Bonds, less Income-tax | £887 7 6 | |
| (2) Interest on Debenture Stocks, do. | 267 7 6 | |
| (3) Interest on Deposit Receipts, | 22 9 11 | |
| | <u>£1,127 4 11</u> | |
| (4) Dividends on Bank Stocks— | | |
| £6,407 7 8 Royal Bank of Scotland | 4512 11 8 | |
| 2,218 16 5 Bank of England | 183 0 11 | |
| 2,500 0 0 British Linen Co. Bank | 375 0 0 | |
| 1,250 0 0 National Bank of Scotland | 93 15 0 | |
| 1,050 0 0 Commercial Bank of Scotland | 81 0 0 | |
| 1,741 13 4 Bank of Scotland | 209 0 0 | |
| | <u>1,451 7 7</u> | |
| <u>£15,197 17 5</u> | | 2,581 12 6 |
| 4. SUBSCRIPTIONS— | | |
| Annual Subscriptions | £1,015 13 0 | |
| Life Subscriptions | 794 0 0 | |
| | <u>1,809 13 0</u> | |
| 5. TRANSACTIONS—Sales, £13, 16s. 5d.; Advertisements, £44, 9s. 8d. | 58 6 1 | |
| 6. SUM received from Government in aid of Expenses of Agricultural Experiments | 150 0 0 | |
| 7. RECEIPTS from Dumfries Show | 6,766 6 0 | |
| 8. RECEIPT in connection with Aberdeen Show | 1 0 0 | |

SUM OF CHARGE £11,690 0 9

AGRICULTURAL SOCIETY of SCOTLAND for the Year 1894-95.

DISCHARGE.

| | | | |
|---|--------|----|----|
| 1. ESTABLISHMENT EXPENSES— | | | |
| Salaries and Wages | £957 | 16 | 8 |
| Fee-duty, £28; Taxes, £38, 15s. | 06 | 15 | 0 |
| Coals and Gas, £18, 14s. 11d.; Insurance, £16, 15s. 8d. | 85 | 10 | 7 |
| Repairs and Furnishings | 63 | 11 | 11 |
| | £1,123 | 14 | 2 |
| 2. FEE to Auditor of Accounts for year 1893-94 | 50 | 0 | 0 |
| 3. FEE to Practical Engineer for year to 30th June 1895 | 20 | 0 | 0 |
| 4. AGRICULTURAL EDUCATION— | | | |
| Prizes to Class, £10; Fees to Examiners, Expenses, and Luncheons, £45, 1bs. | 55 | 18 | 0 |
| 5. CHEMICAL DEPARTMENT— | | | |
| (1) Salary to Chemist | £125 | 0 | 0 |
| (2) Chemists' Fees and Expenses— | | | |
| Allowance for half-year to Whitsunday 1895 | £100 | 0 | 0 |
| Fees for Analyses | 37 | 0 | 0 |
| Fees and Expenses for Experiments | 22 | 17 | 2 |
| | 179 | 17 | 2 |
| (3) District Experiments—Votes, Expenses, &c., £70, 14s. 1d.; Manures, £1, 3s. 10d. | 71 | 17 | 11 |
| (4) Printing | 4 | 9 | 6 |
| | 381 | 4 | 7 |
| 6. VETERINARY DEPARTMENT—Fee to Professor Williams, £26, 5s.; Medals to Students, £19, 12s. | 45 | 17 | 0 |
| 7. BOTANICAL DEPARTMENT—Fee to Botanist for year, £25; Fees and Expenses visiting Pastures, and Experiments, £27, 11s. 10d. | 52 | 11 | 10 |
| 8. SPECIAL GRANTS—Vote to Scottish Dairy Institute, £60; Vote to Forestry Chair in Edinburgh University, for 1895, £50; Grant to Highland Home Industries and Arts Association, £40 | 150 | 0 | 0 |
| 9. TRANSACTIONS—Volume for 1895—Printing, Binding, Postage, Literary Contributions, Reports, &c. | 649 | 15 | 2 |
| 10. ORDINARY Printing and Lithographing, £85, 4s. 6d.; Advertising, £26, 6s. 4d.; Stationery, Books, and Binding, £30, 5s. 4d.; Postages, £59; Bank and Post-Office Charges and Telegrams, £7, 6s. 7d. | 208 | 2 | 9 |
| 11. SUBSCRIPTIONS to Public Societies—Scottish Meteorological Society, £20; Society for Prevention of Cruelty to Animals, £5 | 25 | 0 | 0 |
| 12. MISCELLANEOUS EXPENSES—Making Catalogue of Society's Library, £15; Secretary's Expenses attending Shows, £8, 18s.; Expenses of Rev. John Gillespie and the Secretary attending Dairy Conference in London, £16, 11s.; Secretary's Expenses attending Nomination of Directors, £21, 5s.; Reporting Meetings, £21; Luncheons to Directors, £17, 10s.; Large Arms Die, £10, 10s.; Handsets, £1, 10s.; Telegraphic Address, £1, 1s.; Storing Boxes, 13s.; Restricting Medals, 9s. 6d. | 114 | 5 | 6 |
| 13. INVESTMENTS made—£12,200; less realised, £11,217, 12s. 5d. | 982 | 7 | 7 |
| 14. PAYMENTS in connection with Aberdeen Show—Premiums, £113, 10s.; Expenses, £2, 18s. 6d. | 116 | 3 | 6 |
| 15. PAYMENTS in connection with Dumfries Show—Premiums, £1,841, 14s. 6d.; General Expenses, £3,089, 18s. | 5,881 | 7 | 6 |
| 16. PREMIUMS for District Competitions | 204 | 8 | 8 |
| 17. PREMIUMS for Cottages and Gardens | 12 | 18 | 8 |
| 18. ARREARS struck off as irrecoverable | 36 | 11 | 6 |
| 19. ARREARS outstanding at 30th November 1895 | 106 | 12 | 0 |
| 20. BALANCE due by Royal Bank of Scotland on Accounts Current at 30th November 1895 | 1,523 | 2 | 4 |

SUM OF DISCHARGE £11,690 0 9

W. S. WALKER, *Treasurer.*

JAS. H. GIBSON-GRAIG, *Member of Finance Committee.*

WM. HOME COOK, C.A., *Auditor.*

VIEW OF RECEIPTS AND PAYMENTS

For the Year 1894-95.

RECEIPTS.

| | | | |
|--|---------|----|----|
| 1. ANNUAL SUBSCRIPTIONS AND ARREARS received | £918 | 2 | 0 |
| 2. LIFE SUBSCRIPTIONS | 794 | 0 | 0 |
| | <hr/> | | |
| | £1,712 | 2 | 0 |
| 3. INTERESTS AND DIVIDENDS received— | | | |
| Interests | £1,127 | 4 | 11 |
| Dividends | 1,454 | 7 | 7 |
| | <hr/> | | |
| | 2,581 | 12 | 6 |
| 1. TRANSACTIONS | 58 | 6 | 1 |
| 5. SUM received from Government in aid of Expenses of Agricultural Experiments | 150 | 0 | 0 |
| 6. RECEIPTS from Dumfries Show | 6,766 | 6 | 0 |
| 7. RECEIPT in connection with Aberdeen Show | 1 | 0 | 0 |
| | <hr/> | | |
| SUM OF RECEIPTS | £11,269 | 6 | 7 |

PAYMENTS.

| | | | |
|--|--------|----|----|
| 1. ESTABLISHMENT— | | | |
| Salaries and Wages | £957 | 16 | 8 |
| Fen-duty, Taxes, Coals, Gas, Insurance, | | | |
| Repairs and Furnishings | 165 | 17 | 6 |
| | <hr/> | | |
| | £1,123 | 14 | 2 |
| 2. FEE TO AUDITOR of Accounts for 1893-94 | 50 | 0 | 0 |
| 3. FEE TO PRACTICAL ENGINEER | 20 | 0 | 0 |
| 4. AGRICULTURAL EDUCATION (including Fees to Examiners) | 55 | 18 | 0 |
| 5. CHEMICAL DEPARTMENT | 381 | 4 | 7 |
| 6. VETERINARY DEPARTMENT | 45 | 17 | 0 |
| 7. BOTANICAL DEPARTMENT | 52 | 11 | 10 |
| 8. SPECIAL GRANTS | 150 | 0 | 0 |
| 9. TRANSACTIONS | 649 | 15 | 2 |
| 10. ORDINARY Printing, Advertising, Stationery, Postages, and Bank Charges | 208 | 2 | 9 |
| 11. SUBSCRIPTIONS to Public Societies | 25 | 0 | 0 |
| 12. MISCELLANEOUS | 111 | 5 | 6 |
| 13. PAYMENTS in connection with Aberdeen Show— | | | |
| Premiums | £113 | 10 | 0 |
| Sundries | 2 | 13 | 6 |
| | <hr/> | | |
| | 116 | 3 | 6 |
| 14. PAYMENTS in connection with Dumfries Show— | | | |
| Premiums | £1,841 | 14 | 6 |
| General Expenses, as per Abstract | 3,989 | 13 | 0 |
| | <hr/> | | |
| | 5,831 | 7 | 6 |
| 15. PREMIUMS for District Competitions | 204 | 8 | 8 |
| 16. PREMIUMS for Cottages and Gardens | 12 | 18 | 8 |
| SUM OF PAYMENTS | <hr/> | | |
| | 9,041 | 7 | 4 |
| BALANCE OF RECEIPTS | £2,227 | 19 | 3 |

W. S. WALKER, *Treasurer.*

JAS. H. GIBSON-CRAIG, *Member of Finance Committee.*

WM. HOME COOK, C.A., *Auditor.*

EDINBURGH, 8th January 1896.

ABSTRACT of the ACCOUNTS of the ARGYLL NAVAL FUND for 1894-95.

CHARGE.

| | | | |
|---|---------------|-----------|----------|
| 1. FUNDS as at 30th November 1894— | | | |
| £3,193, 6s. 8d. 3 per cent Debenture Stock of the North British Railway Company, purchased at | £2,650 | 0 | 0 |
| £3,000 Funded Debt of the Clyde Navigation Trustees, purchased at | 2,970 | 0 | 0 |
| £305 Royal Bank of Scotland Stock, purchased at | 671 | 0 | 0 |
| | <u>£6,291</u> | <u>0</u> | <u>0</u> |
| BALANCE in Royal Bank of Scotland— | | | |
| On Deposit Receipt dated 8th March 1894 | £200 | 0 | 0 |
| On Current Account | 186 | 16 | 4 |
| | <u>386</u> | <u>16</u> | <u>4</u> |
| | <u>£6,677</u> | <u>16</u> | <u>4</u> |
| 2. INCOME received— | | | |
| Interest on Investments— | | | |
| On £3,193, 6s. 8d. North British Railway Company 3 per cent Debenture Stock, £95, 16s., tax £3, 3s. 10d. | £92 | 12 | 2 |
| On £3,000 Funded Debt of the Clyde Navigation Trustees at 4 per cent, £120, tax £4 | 116 | 0 | 0 |
| On £305 Royal Bank Stock | 24 | 8 | 0 |
| On Deposit Receipt with Royal Bank of Scotland p. £200, dated 8th March 1894, and uplifted 19th November 1895 | 4 | 6 | 0 |
| | <u>237</u> | <u>6</u> | <u>2</u> |
| SUM OF CHARGE | <u>£6,915</u> | <u>2</u> | <u>6</u> |

DISCHARGE.

| | | | |
|---|---------------|-----------|----------|
| 1. ALLOWANCE to the six following Recipients— | | | |
| Edward Leonard Grieve, first year (first half) | £20 | 0 | 0 |
| John Henry Tod, first year (first half) | 20 | 0 | 0 |
| Percy Lockhart H. Noble, first year | 40 | 0 | 0 |
| Colin Kenneth Maclean, second year | 40 | 0 | 0 |
| Leylie Menzies, second year | 40 | 0 | 0 |
| John Allan Gregory, third year | 40 | 0 | 0 |
| | <u>£200</u> | <u>0</u> | <u>0</u> |
| 2. EXPENSES of Management— | | | |
| Keith & Co., for Advertising | 1 | 2 | 4 |
| 3. FUNDS at 30th November 1895— | | | |
| £3,193, 6s. 8d. 3 per cent Debenture Stock of the North British Railway Company, purchased at | £2,650 | 0 | 0 |
| £3,000 Funded Debt of the Clyde Navigation Trustees, purchased at | 2,970 | 0 | 0 |
| £405 Royal Bank of Scotland Stock, purchased at | 893 | 14 | 6 |
| | <u>£6,513</u> | <u>14</u> | <u>6</u> |
| Balance on Account Current with Royal Bank of Scotland | 200 | 5 | 8 |
| | <u>6,714</u> | <u>0</u> | <u>2</u> |
| SUM OF DISCHARGE | <u>£6,915</u> | <u>2</u> | <u>6</u> |

W. S. WALKER, *Treasurer.*

JAS. H. GIBSON-CRAIG, *Member of Finance Committee.*

WM. HOME COOK, C.A., *Auditor.*

EDINBURGH, 8th January 1896.

ABSTRACT of the ACCOUNTS

CHARGE.

1. LOCAL SUBSCRIPTIONS—

| | |
|---|----------|
| Voluntary Assessment, Dumfriesshire | £942 8 1 |
| " " Kirkcudbright | 400 0 0 |
| " " Wigtonshire | 155 0 0 |
| Contribution by Town of Dumfries | 75 0 0 |
| Amount of Private Subscriptions | 129 5 6 |

£1,701 13 7

2. AMOUNT COLLECTED DURING SHOW—

| | |
|--|-------------|
| Drawn at Gates | £2,115 14 0 |
| Drawn at Grand Stand | 282 16 3 |
| Catalogues and Awards sold | 196 18 6 |
| Lavatory and Directors' Cloak-Room | 1 3 10 |

2,599 12 7

| | |
|---|-----------|
| 3. FORAGE AND MANURE SOLD | 14 5 1 |
| 4. RENT OF STALLS | 1,743 2 6 |
| 5. RENT OF REFRESHMENT BOOTHS | 200 0 0 |
| 6. FINES FOR NON-EXHIBITION OF LIVE STOCK | 47 10 0 |
| 7. INCOME FROM TWEEDDALE MEDAL FUND | 18 2 6 |
| 8. ADVERTISING IN CATALOGUE AND PREMIUM LIST | 143 8 2 |
| 9. SPECIAL PRIZES CONTRIBUTED | 265 0 0 |
| 10. DRAWN AT EXHIBITION OF BINDERS AND TURNIP-LITTERS | 20 17 6 |
| 11. INTEREST FROM ROYAL BANK | 7 14 1 |
| 12. EDINBURGH AGRICULTURAL ASSOCIATION — LOAN OF HORSE-SHOERING PLANT | 5 0 0 |

£6,766 6 0

Note.—From the above balance of £934 18 6
 There has to be deducted the premiums undrawn at 30th
 November 1895, amounting to 239 10 0

Making the probable Surplus £695 8 6

EDINBURGH, 8th January 1896.

of the DUMFRIES SHOW, 1895.

DISCHARGE.

| | | |
|--|-------------|--|
| 1. SHOWYARD EXPENDITURE— | | |
| Fitting up Showyard | £2,336 15 0 | |
| Rent and preparation of the Field | 108 6 9 | |
| Dumfries Water Commission—laying pipes to Showyard | 25 0 0 | |
| Rosettes | 18 0 3 | |
| Miscellaneous | 35 12 3 | |
| | <hr/> | |
| | £2,523 14 3 | |
| 2. FORAGE | 273 17 0 | |
| 3. POLICE | 57 8 10 | |
| 4. TRAVELLING EXPENSES of Judges, Stewards, &c. | 127 15 5 | |
| 5. HOTEL AND LUNCHEONS— | | |
| Hotel Bill for 23 Directors, 6 Stewards, 31 Judges, Auditor, Veterinary Inspector, Engineer, Secretary, &c. | £213 11 2 | |
| Luncheons in Showyard for Judges, Directors, Attending Members, and Members of Committee, and Breakfasts for Stewards, Assistants, &c. | 72 19 3 | |
| | <hr/> | |
| | 286 10 5 | |
| 6. MUSIC | 37 10 0 | |
| 7. PRINTING | 224 6 0 | |
| 8. ADVERTISING and Bill-posting | 89 8 11 | |
| 9. HORSE-SHOEING COMPETITION | 53 13 5 | |
| 10. HIGHLAND INDUSTRIES | 5 0 0 | |
| 11. VETERINARY INSPECTION | 10 10 0 | |
| 12. LOCAL SECRETARY | 12 12 0 | |
| 13. PRACTICAL ENGINEER | 41 3 0 | |
| 14. EXHIBITION OF BINDERS | 30 6 10 | |
| 15. TRIAL OF TURNIP-LIFTERS | 24 14 1 | |
| 16. ASSISTANTS and Attendants | 130 13 6 | |
| 17. POSTAGES | 52 10 0 | |
| 18. MISCELLANEOUS | 7 19 4 | |
| | <hr/> | |
| AMOUNT OF GENERAL EXPENSES | £3,989 13 0 | |
| 19. PREMIUMS drawn at 30th November 1895 | 1,841 14 6 | |
| | <hr/> | |
| | £5,831 7 6 | |
| BALANCE OF RECEIPTS | 934 18 6 | |
| | <hr/> | |
| | £6,766 6 0 | |

W. S. WALKER, *Treasurer.*JAS. H. GIBSON-CRAIG, *Member of Finance Committee.*WM. HOME COOK, C.A., *Auditor.*

PROCEEDINGS AT BOARD MEETINGS.

MEETING OF DIRECTORS, 6TH FEBRUARY 1895.

Present.—*Ordinary Directors*—Mr Sinclair Scott, Burnside; Sir Robert Menzies of Menzies, Bart.; Sir James H. Gibson-Craig of Riccarton, Bart.; Mr Marr, Cairnbrogie; Rev. John Gillespie, Mouswald; Mr Middleton, Clay of Allan; Mr Speir, Newton Farm; Mr W. H. Lumsden of Balmedie; Mr Scott Dudgeon, Longnewton; Mr Cross of Knockdon; Mr Malcolm, Dunmore Home Farm; Captain R. Durdas, yr. of Arniston; Mr Cameron, Balnakyle; Mr M'Gibbon, Ardnacraig; Mr Hutcheson, Beechwood; Mr Martin of Auchendennan; Mr Hope, Eastbarns; Mr Gordon of Newton; Mr Maxwell of Kirkennan; Mr Wilson, Chapelhill. *Extraordinary Directors*—Provost Scott, Dumfries; Mr Kirkpatrick, Amisfield; Mr Wilson, junior, Carbeth; Mr Cran, Kirkton; Mr Gilmour of Montrave; Mr Elliot, Hollybush; Mr Ferguson, Pietstonhill; Mr Glendinning, Hatton Mains. *Honorary Secretary*—Sir G. Graham Montgomery of Stanhope, Bart. *Engineer*—Mr J. D. Park. Sir James H. Gibson-Craig in the chair.

The SECRETARY reported apologies for the absence of Sir Robert Jardine of Castle-milk, Bart.; Mr Aitken, Norwood; Mr Allan, North Kirkland; Mr Cowe, Balhousie; Mr Davidson, Saughton Mains; Mr Dickson, Dabton; Mr Dudgeon, The Grange; Captain Clayhills Henderson of Invergowrie, R.N.; Mr James Auldjo Jamieson, W.S.; Mr Lockhart, Mains of Airies; Mr Marshall, Lochfergus; Mr Maxwell of Munches; Mr Paterson, Hill of Drip; Mr Pott of Dod.

LETTER FROM THE DUKE OF YORK.

The SECRETARY read the following letter, signed by Sir Francis de Winton:—

“YORK COTTAGE, SANDRINGHAM, 12th January.

“In reply to your letter of 24th and enclosure, I am directed by His Royal Highness to request you to convey his thanks to the meeting of the Highland and Agricultural Society for the resolution conveyed in your letter. His Royal Highness is further very pleased to learn the success which has attended the Society during the terms of his presidency.”

APPOINTMENT OF CHAIRMAN.

On the motion of the Rev. JOHN GILLESPIE, Mouswald, seconded by Mr ALEXANDER M. GORDON of Newton, Sir James Gibson-Craig, Bart., was re-elected Chairman of the Board of Directors for another term.

THE DUMFRIES SHOW.

The SECRETARY read a letter from the Town-Clerk of Dumfries pointing out that the place fixed for the holding of this year's Show is situated one and a half miles from Dumfries, and that a great many visitors would go straight by rail to Maxwelltown Station, and not go through Dumfries at all. The letter concluded by asking whether it was not yet possible to place the showyard where it would give more satisfaction to the citizens of Dumfries.

Provost SCOTT, Dumfries, said the Corporation thought it hard to have given such a large subscription as £75 and to receive no benefit. There was also a strong feeling existing in Dumfries on the matter.

The CHAIRMAN said it was impossible to reconsider the matter, because the Society had contracted for the field fixed upon for the Show. The Provost, he thought, had rather exaggerated the extent of the loss to the Dumfries people.

Rev. JOHN GILLESPIE said that as far as he knew the site fixed on was the only suitable showyard available.

After some further conversation the subject dropped.

THE APPOINTMENT OF JUDGES.

Mr JOHN M. MARTIN, Auchendennan, Alexandria, moved: "That the Board now decides which Shows shall be included in the list, judging at which renders gentlemen ineligible for acting as judges at the Society's Show of the same year; and that the decision of the Board be embodied in the regulations for the appointment of judges." Mr JOHN MARR, Cairnbrogie, seconded.

Mr W. S. FERGUSON, Perth, moved that they adhere to the present practice.

Mr JOHN GILMOUR, Montrave, moved: "That judges be selected by this Society with no reference to duties they may perform as judges during the present year." He thought if an exception was made in the case of the Royal Society they would be doing everything that was required. Otherwise the Directors should have a very open choice of judges.

On a vote Mr Gilmour's motion was carried.

GRANTS FOR TECHNICAL EDUCATION.

A letter was read from the Secretary of the Glasgow and West of Scotland Technical College, applying for a grant towards the funds of that College, and asking the Board to receive a deputation in support of the application.

The CHAIRMAN directed the Board's attention to the resolution of the Directors in March 1892, "That considering the large sums at the disposal of County Councils for furthering technical education, this Society should not contribute to any such purposes."

It was unanimously agreed to adhere to that finding.

MEETING OF DIRECTORS, 6TH MARCH 1895.

Present. — *Vice-Presidents* — The Earl of Stair, K.T., Lochinch; Wellwood H. Maxwell of Munches. *Ordinary Directors* — Sir Robert Menzies of Menzies, Bart.; Mr Paterson, Hill of Drip; Sir James H. Gibson-Craig of Riccarton, Bart.; Rev. John Gillespie, Mouswald; Mr Middleton, Clay of Allan; Mr Spier, Newton Farm; Mr Dun, Easter Kincaide; Mr Davidson, Saughton Mains; Mr Scott Dudgeon, Longnewton; Mr Cross of Knockdon; Mr Malcolm, Dunmore Home Farm; Captain Robert Dundas, yr. of Arniston; Mr Cowe, Balhousie; Mr Lockhart, Mains of Airds; Mr Hutcheson, Beechwood; Mr Hope, East Barns; Mr J. D. Fletcher of Roselaugh; Mr Wilson, Chapelhill. *Extraordinary Directors* — Mr M'Kie of Ernespie; Mr R. F. Dudgeon, The Grange; Mr Greig, Rephad; Mr Wilson, yr. of Carbeth; Mr Cran, Kirkton; Mr Elliot, Hollybush; Mr G. R. Glendinning, Hatton Mains. *Auditor* — Mr William Home Cook, C.A. *Engineer* — Mr J. D. Park. Sir James H. Gibson-Craig in the chair.

The SECRETARY reported apologies for the absence of Mr Aitken, Norwood; Mr Allan, North Kirkland; Mr Johnstone, Douglas of Lockerbie; Mr Drew of Craigen-callie; Mr Ferguson, Prestonhill; Mr Gilmour of Montrave; Mr Gordon of Newton; Mr Kirkpatrick, Amisfield; Mr Lumsden of Balmadie; Mr M'Gibbon, Ardnacraig; Mr Marshall, Longfergus; Mr Martin of Auchendennan; Mr Pott of Dodd; Colonel Stirling of Kippendavie; Dr Aitken, Chemist.

THE LATE MR CAMPBELL MACPHERSON GRANT.

The CHAIRMAN referred in appropriate terms to the loss which the Society had sustained through the death of Mr Campbell Macpherson Grant of Drumduan. That was not the place or time to speak of one's personal feelings, but he could only say that he had lost a friend of his lifetime. He referred to what the House of Ballin-

dalloch had done for the Society, and the great attachment which the deceased gentleman had for the Aberdeen-Angus and Shetland pony stock. A special minute, couched in the following terms, was then read and adopted—viz.: “That the Directors resolve to record in the minutes an expression of the deep and sincere regret with which they received the intimation of the death of Mr Campbell Macpherson Grant of Drumduan, one of their number, and of their sense of his valuable services to the Society as a Director and a member of various Committees, and as a liberal contributor for many years to the premiums for the annual Show.”

DUKE OF BuccLEUCH'S CHAMPION MEDALS.

The following champion bronze medals were intimated from this year's President, the Duke of Buccleuch and Queensberry, K.T., for the best animal or pen in each of the following sections: Shorthorns, Aberdeen-Angus, Galloway, Highland, Ayrshire, Clydesdale Stallions, Clydesdale Mares and Fillies, Draught Geldings, Hunters, Roadsters, Hackneys, Ponies, Shetland Ponies, Blackfaced Sheep, Cheviot, Border Leicester, Shropshire, Half-Bred Sheep, Swine.

Note.—Winners at former Shows entered as Extra Stock may compete for these medals. The award of these medals is not subject to the rules as to calving and foaling.

Mr COWE moved that these be accepted with thanks, which was agreed to.

DIRECTORS' TERM OF OFFICE.

Mr JOHN SPEIR, Newton, moved: “That a Committee be appointed to consider the length of service of Directors who have not been nominated by any Show District, and, if thought necessary, to fix a maximum limit to the number of years, after which compulsory retirement for one year will be necessary.”

Mr MALCOLM seconded, and after discussion it was unanimously agreed “That a Committee be appointed to consider and report regarding the by-laws relating to the election of Directors of this Society.” The Committee appointed consisted of Messrs Martin of Auchtermannan; Hutchinson, Perth; Malcolm, Dunmore; Gillespie, Mouswald; Gordon of Newton; Middleton, Clay of Allan; Walter Elliot, Hollybush; Milnour of Montrave; Glendinning, Hatton Mains; Scott Dudgeon, Longnewton; Speir, Newton; and the Chairman, *ex officio*.

PUBLICATIONS.

The Publication Committee intimated that arrangements had been made for the forthcoming volume of the ‘Transactions.’

HIGHLAND INDUSTRIES.

The Shows Committee agreed to a motion by Mr GILLESPIE, “To grant £40 to the Highland Home Industries Association for this year, and that it be made known to them that applications for grants had been received from the Lochbroom and Gairloch branches of the same Association, and that they be recommended to give grants to these Associations.”

CHEMICAL AND BOTANICAL.

An application was submitted from the Kelso Analytical Association, asking for a grant towards testing seeds. The Committee thought it desirable that assistance should be given to local societies in testing seeds. It was remitted to a Committee to draft a scheme, and submit to Directors.

It was agreed, on the motion of Mr COWE, seconded by Mr CROSS, that the new arrangements with Dr Aitken date from Whitsunday 1895.

MEETING OF DIRECTORS, 3d APRIL 1895.

Present.—*Ordinary Directors*—Mr Sinclair Scott, Burnside; Sir Robert Menzies of Menzies, Bart.; Mr Paterson, Hill of Drip; Mr Marr, Cairnbrogie; Rev. John Gillespie, Mouswald; Mr Middleton, Clay of Allan; Mr Speir, Newton Farm; Mr Dun, Easter Kincaid; Mr Davidson, Saughton Mains; Mr W. H. Lumsden of Balmedie; Mr Scott Dudgeon, Longnewton; Mr Cross of Knockdon; Mr Malcolm, Dunmore Home Farm; Captain Robert Dundas, yr. of Arniston; Mr Lockhart, Mains of Airies; Mr C. M. Cameron, Balnakyle; the Hon. the Master of Polwarth, Humble House; Mr M'Gibbon, Ardnacraig; Mr Hutcheson, Beechwood; Mr Martin of Auchendennan; Mr. A. M. Gordon of Newton; Mr Wellwood Maxwell of Kirkennan; Mr Wilson, Chapelhill. *Extraordinary Directors*—Mr R. F. Dudgeon, The Grange; Mr Marshall, Lochfergus; Mr Wilson, yr. of Carbeth; Mr Allan, North Kirkland; Mr Aitken, Norwood; Mr Gilmour of Montrave; Colonel Stirling of Kippendavie; Mr Elliot, Hollybush; Mr Ferguson, Pictstonhill; Mr Glendinning, Hatton Mains. *Chemist*—Dr A. P. Aitken. *Engineer*—Mr James D. Park. Sir James H. Gibson-Craig in the chair.

The SECRETARY reported apologies for the absence of Sir Robert Jardine of Castle-milk, Bart.; Mr Cowe, Balhousie; Mr Cran, Kirkton; Mr Drew of Craigenallie Mr Greig, Rephad; Mr Kirkpatrick, Amisfield; and Mr Pott of Dod.

NOTICE OF MOTION.

Mr JOHN M. MARTIN of Auchendennan gave notice of the following motion: "That a Committee be appointed to reconsider the question of appointment of the judges, in view of the experience gained of the working of present system at the meeting of Committee on 3d April."

The CHAIRMAN held that it was quite irregular to give notice of a motion at a meeting of the Board.

Mr MARTIN said he was sorry if he had done anything that was irregular. He had, however, been a member of the Board of Directors for twenty years, and he was perfectly sure that at least as many as twenty motions had been given notice of during that period in the same way as had been done by him that day. If under these circumstances he had done anything that was irregular, he apologised to the Board.

The CHAIRMAN quoted from the by-laws to show that it was sufficient to send in a notice of motion to the Secretary in writing at least eight days before the motion was brought forward.

LETTER FROM SIR G. M. GRANT.

The SECRETARY read to the meeting a letter from Sir George Macpherson Grant of Ballindalloch, Bart., acknowledging receipt of a letter containing an excerpt from the minutes of the last meeting of Directors regarding the death of Mr Macpherson Grant of Drumduan. Sir George said his late brother took a deep interest in the Society, and he was truly glad to know that his brother's services were appreciated.

CHAIRMAN OF THE PERTH LOCAL COMMITTEE.

The CHAIRMAN said the Secretary was anxious that the chairman of the Perth Local Committee should be appointed as early as possible, in order to get on with the work of raising subscriptions. He moved the suspension of the standing orders so that the appointment could be proceeded with at once.

Mr JOHN GILMOUR of Montrave said he had great pleasure in moving that Lord Balvaird be appointed chairman of the Perth Local Committee. He need not refer to the services which his Lordship's late father had rendered to the Society, and to agriculture generally. These were perfectly well known to them. They could not have a man who more fittingly filled the position, and they wished to make the Perth Show a great success.

The motion was unanimously agreed to.

DUMFRIES SHOW.

Judges.—The CHAIRMAN said the Judges had been appointed in conformity with the regulations, but they could not make them public until they had the authority of the gentlemen to say that they would act. As soon as they had agreed to do so the list would be forwarded to the newspapers.

Stewards.—The following gentlemen were appointed to act as Stewards of the

various sections of the Dumfries Show: *Horses*—Mr W. S. Ferguson, Pictstonhill. *Cattle*—The Rev. John Gillespie, Mouswald. *Sheep*—Mr Elliot, Hollybush. *Forage*—Mr Buttar, Corston. *Parade Steward*—Mr Dudgeon, Grange. *Implements*—Mr Jonathan Middleton, Clay of Allan, and Mr Glendinning, Hatton Mains.

Local Committee.—The Local Committee for Dumfries Show appointed in the Dumfries district were submitted and approved.

APPOINTMENT OF DIRECTORS.

On the motion of Mr JONATHAN MIDDLETON, Clay of Allan, seconded by Mr LUMSDEN of Balmedie, it was unanimously agreed to appoint Mr John Macpherson Grant, yr. of Ballindalloch, a Director in room of the late Mr Macpherson Grant of Drumduan.

EXPERIMENTS.

It was reported on behalf of the Science Committee that the following experiments would be conducted during the year: The top-dressing of oats with various manures, to cost not more than £10; rotation of grasses (continued), £5; trial of various classes of clover-seeds by a Committee, £15; on the prevention of clover-sickness and tulip-root by the Chemist and Botanist conjointly, £50; experiments with feeding-stuffs, £60; the effect of feeding-stuffs on milk, £20; and on the growth of finger-and-toe in turnips, £10—total maximum cost, £160.

LANDS VALUATION AMENDMENT BILL.

The CHAIRMAN explained the provisions of this bill, and suggested that they should support the action of Mr Maxwell, M.P., in his endeavours in the House of Commons, by which it was proposed that improvements by agricultural tenants should be exempted from the operation of the Act. He moved accordingly.

The Chairman's proposal was unanimously agreed to.

TESTIMONIAL TO DR SMART.

A letter in reference to a proposed testimonial to Dr Andrew Smart, Edinburgh, "in recognition of his services in discovering the cause and cure of the cattle plague," was allowed to lie on the table. The Chairman remarked that this was rather a matter for individual subscribers than the Board.

FORESTRY.

Sir ROBERT MENZIES explained, with reference to Professor Balfour's statement about the probability of obtaining the sum of £5000 from Government if the same amount were secured in Scotland for the founding of a Forestry Chair, that he had not made that statement without having every reason to believe that a grant would be got from the Government.

GOVERNMENT GRANT.

The SECRETARY reported that the amount of Government grant received for agricultural experiments was £150 instead of £200 last year.

MEETING OF DIRECTORS, 1st MAY 1895.

Present.—*Vice-Presidents*—Sir Robert Jardine of Castlemilk, Bart.; and Wellwood H. Maxwell of Munches. *Ordinary Directors*—Mr Sinclair Scott, Burnside; Mr Paterson, Hill of Drip; Sir James H. Gibson-Craig of Riccarton, Bart.; Mr Marr, Cairnbrogie; Rev. John Gillespie, Mouswald; Mr Middleton, Clay of Allan; Mr Pott of Dod; Mr Dun, Easter Kincaid; Mr Davidson, Saughton Mains; Mr Scott Dudgeon, Longnewton; Mr Malcolm, Dunmore Home Farm; Mr Cowe, Balhousie; the Hon. the Master of Polwarth, Humber House; Mr Hutcheson, Beechwood; Mr Martin of Auchendennan; Mr Hope, East Barns; Mr Wilson, Chapelhill. *Extraordinary Directors*—Mr Wilson, yr. of Carbeth; Mr Cran, Kirkton; Mr Gilmour of Montrave; Colonel Stirling of Kippendavie; Mr Elliot, Hollybush; Mr Ferguson, Pictstonhill; Mr Glendinning, Hatton Mains. *Chemist*—Dr A. P. Aitken. *Auditor*

—Mr William Home Cook, C.A. *Engineer*—Mr J. D. Park. *Veterinary Surgeon*
—Principal Williams. Sir James H. Gibson-Craig in the chair.

The SECRETARY reported apologies for the absence of Sir Robert Menzies of Menzies, Bart.; Sir G. Graham Montgomery of Stanhope, Bart.; Mr Cameron, Balnakyle; Mr Cross of Knockdon; Mr Drew, Doonhill; Mr Dudgeon of Cargen; Mr Gordon of Newton; Mr Macpherson Grant, yr. of Ballindalloch; Mr Greig, Rephad; Mr Kirkpatrick, Townfoot; Mr Lockhart, Mains of Airies; Mr Lumsden of Balmedie; Mr M'Gibbon, ArdnaCraig; Mr Marshall, Lochfergus.

Mr MARTIN of Auchendennan, on the minutes being read, referred to the fact that there was no mention in them of the ruling of the Chairman in reference to his notice of motion. The Chairman had said at the last meeting that it was quite irregular to give notice of a motion at a meeting as he had done, and he was anxious that it should be made quite clear whether such was the case or not.

Mr JOHN GILMOUR of Montrave expressed approval of the line of action adopted by Mr Martin. He thought that it was quite in accordance with practice to give notice of a motion as Mr Martin had done.

The CHAIRMAN thought it was very important that any gentleman who was to give notice of a motion should give it full consideration before it was communicated to the press, now that their meetings were open.

Mr MARTIN said he had given full consideration to the subject of his notice of motion, and had it written out before the meeting took place. He had no personal feeling in the matter, but he would like to see the point settled.

After some further discussion, the minutes were slightly altered, with the object of meeting Mr Martin's views.

ACCEPTANCES.

Letters were read from Mr John Macpherson Grant and Mr John MacLachlan, the former accepting the appointment as a member of the Board of Directors and of the Shows Committee, and the latter accepting membership of the Argyll Naval Fund Committee. A letter was also read from Mr David Buttar, Corston, agreeing to act as Steward of Forage for the Dumfries Show.

GENERAL MEETING.

The date of the general meeting of the Society was fixed for 19th June.

DUMFRIES SHOW.

The CHAIRMAN said they had now to consider several matters in connection with Dumfries Show, and he was sure they were all glad to see their old friend Mr Maxwell of Munche, in their midst on such an occasion.

The SECRETARY reported upon the hotel and catering arrangements for the Dumfries Show. He stated that arrangements had been completed with the King's Arms Hotel, Dumfries, the headquarters of the Society, for the accommodation of the Directors and judges. With regard to the catering in the showyard, arrangements had been made with four licensed caterers. Mr Wilson, Argyle Street, Glasgow, had received the contract for the Members' Club and the Directors' Committee Luncheon, and the other licensed caterers were Messrs Hunter & Glover, Edinburgh; Mr John Brodie, Edinburgh; and Mr James Hay, Union Buildings, Aberdeen. The tea pavilion had been given to Mr Oughton, Dumfries.

Mr JOHN M. MARTIN, Auchendennan, said the King's Arms Hotel could not accommodate anything like the number of Directors and judges, and he wished to know if the accommodation outside was of a satisfactory nature. He had heard it expressed by more than one judge that they were not at all comfortably provided for at Aberdeen.

The SECRETARY said the arrangement was that the proprietor of the King's Arms Hotel was to give them all the rooms in the house, numbering 25. The others were to be provided as near as possible to the hotel, and first-class rooms had been promised.

On the motion of Mr MARR, Cairnbrogie, it was remitted to a small Local Committee to look after the lodging accommodation.

A letter was read from Mr E. H. Smith, asking the Directors to give prizes for Oxford Down sheep at the Dumfries Show. As the prize-list had been already published, it was agreed to let the letter lie on the table.

PERTH SHOW, 1896.

A letter was read from Lord Balvaird, Scone Palace, agreeing to act as Convener of the Local Committee of the Show to be held at Perth next year.

It was reported that a meeting had been held at Perth on 15th ult., when it was unanimously resolved to communicate with the Conveners of the respective County Councils in the Show district, asking them to raise, by a voluntary assessment on owners of lands and heritages, contributions to the local fund in aid of the Show.

Mr GILMOUR of Montrave stated that the Finance Committee of the Fife County Council had agreed to raise a voluntary assessment.

DECIMAL SYSTEM OF WEIGHTS AND MEASURES.

A letter was read from the Secretary of the Edinburgh Decimal Association, asking support to the introduction of the metric system of weights and measures. It was pointed out in the letter that such a change would result in a substantial permanent saving in clerical labour.

The MASTER OF POLWARTH said he scarcely thought that public opinion in this country was prepared yet for the adoption of the decimal system. He thought that, as a Society, they should not commit themselves in the matter.

Mr MARR, Cairnbrogie, declared that old customs would survive in spite of legislation.

The Rev. JOHN GILLESPIE said he was in favour of the general principle, although he did not think public opinion was sufficiently ripe for the proposed change. He thought they should express general approval of the metric system, without committing themselves to the question of legislation.

Mr SINCLAIR SCOTT, Flatt Farm, Largs, took a similar view.

Mr SCOTT DUDGEON, Longnewton, said he did not know how they were to get public opinion influenced unless they took some steps in the matter. He moved "That the Board resolve in favour of the decimal system as applicable to weights and measures being made compulsory." Mr GILMOUR of Montrave seconded.

Mr MAXWELL of Munches considered that some movement in this direction was loudly called for.

The MASTER of POLWARTH moved the deletion of the words "being made compulsory." He declared that their farm servants were not yet educated enough on the subject. Mr MARR of Cairnbrogie seconded the amendment.

On a division, the amendment only received the support of the mover and seconder, and the motion was accordingly carried.

MISCELLANEOUS.

On the motion of Mr JOHN M. MARTIN, Auchendennan, a Committee was appointed to reconsider the rules for the appointment of judges, in view of the experience gained of the working of the present system at the meeting of Committee of 3d April.

It was reported that the Royal Commission on Agriculture would sit in Edinburgh on 3d June, and continue for two weeks. It was agreed to give the Commission the use of the board-room; and Mr GILMOUR of Montrave, on behalf of the Commission, thanked the Board for this courtesy.

MEETING OF DIRECTORS, 5TH JUNE 1895.

Present.—*Vice-President*—The Right Hon. the Earl of Stair, K.T. *Ordinary Directors*—Mr Paterson, Hill of Drip; Sir James H. Gibson-Craig of Riccarton, Bart.; Mr Marr, Cairnbrogie; Rev. John Gillespie, Mouswald; Mr Middleton, Clay of Allan; Mr Pott of Dod; Mr Dun, Easter Kincapple; Mr Davidson, Saughton Mains; Mr Cross of Knockdon; Captain Clayhills Henderson of Invergowrie, R.N.; Mr Malcolm, Dunnmore Home Farm; Captain Robert Dundas, yr. of Arniston; Mr Cowe, Balhousie; Mr Lockhart, Mains of Airies; Mr Cameron, Balnakyle; Mr Hutcheson, Beechwood; Mr Martin of Auchendennan; Mr Hope, East Barns; Mr Gordon of Newton; Mr Maxwell of Kirkennan; Mr Wilson, Chapelhill; Mr John Macpherson Grant, yr. of Ballindalloch. *Extraordinary Directors*—Mr Kirkpatrick, Townfoot; Mr Greig, Rephad; Mr Wilson, yr. of Carbeth; Mr Cran, Kirkton; Mr Aitken, Norwood; Mr Elliot, Hollybush; Mr Ferguson, Pictstonhill; Mr Glendinning, Hatton Mains. *Auditor*—Mr Home Cook, C.A. *Engineer*—Mr J. D. Park. Sir James H. Gibson-Craig in the chair.

The SECRETARY reported apologies for the absence of Sir Robert Menzies of that ilk, Bart.; Sir G. Graham Montgomery of Stanhope, Bart.; Mr Allan, Munnoch; Mr Drew, Doonhill; Mr Lumsden of Balmedie; Mr McGibbon, Ardnacraig; Mr Sinclair Scott, Burnside; Mr Speir, Newton Farm.

CONGRATULATING THE CHAIRMAN.

The Rev. JOHN GILLESPIE, Mouswald, asked leave to move the suspension of the standing orders to permit of his submitting a motion conveying to Sir James H. Gibson-Craig, Bart., and Lady Gibson-Craig the hearty congratulations and good wishes of the Society on the approaching celebration of their silver wedding. The request being unanimously granted, Mr Gillespie said the members of the Board did not require to be reminded of the invaluable services which Sir Gibson-Craig had rendered to the Society during the twelve and a half years he had been a Director. They all knew the untiring zeal and ceaseless labour which he had shown in promoting the best interests of the Society and in transacting the business of the Board. Mr Gillespie also moved that the Secretary be instructed to engross in the minutes of that meeting the copy of an inscription on a bowl which the Directors, in their private capacity, had presented to Sir James Gibson-Craig the previous evening. The inscription bore that the bowl was presented, on the occasion of their silver wedding, to Sir James Gibson-Craig and Lady Gibson-Craig by the Directors of the Highland and Agricultural Society of Scotland in appreciation of the untiring and valuable services which Sir James Gibson-Craig had rendered to the Society, and more especially for the services which he had rendered as Chairman of the Board of Directors.

Mr COWE, Balhousie, seconded, and referred to the unfailing kindness and courtesy which each and all of them received at the hands of Sir James Gibson-Craig.

The SECRETARY put the motion to the meeting, and it was agreed to unanimously and amid applause.

Sir JAMES GIBSON-CRAIG, in reply, said this was certainly a most unexpected pleasure. He never thought that any public recognition would be made of the small service he had been able to render to them. He thought that everything that could be said had been given expression to the previous evening, when they had presented him with a most handsome testimonial. Sir James said he could only thank them most sincerely for their expression of kindness towards him. The uniform kindness which he had received at their hands by electing him to be their Chairman for a second time was more than he could ever forget or repay.

THE DUMFRIES SHOW.

A report was submitted regarding the arrangements for the Dumfries Show.

Mr COWE expressed the hope that the Local Committee would see that the Directors got separate sleeping apartments. He thought the Directors and judges should have the first call on the accommodation at the headquarters of the Society before outsiders were taken in.

The CHAIRMAN said the Committee would do the best they could under the circumstances, but he must remind Mr Cowe and others that the accommodation at Dumfries was very limited.

Attending members were appointed to assist at the various rings in the showyard.

COMMISSION ON CHEQUES.

Mr J. M. MARTIN of Auchinlennan suggested the propriety of the Directors considering the question of adopting some system whereby persons winning prizes at the annual Show of the Society could get their cheques cashed free of commission. There had been some talk among exhibitors on the subject.

The CHAIRMAN said they were indebted to Mr Martin for bringing up the subject. There would, however, be some difficulty in getting the suggestion carried into effect, owing to an arrangement between the Scotch banks.

Mr W. S. FERGUSON, Pictstonhill, said he was always very glad to pay commission on cheques received as prize-money from the Highland Show.

It was eventually agreed to leave the matter in the hands of the Chairman and the Secretary to make the best arrangement practicable.

THE TERMS AND CONDITIONS OF MEMBERSHIP.

The CHAIRMAN moved that a Committee be appointed to consider and report as to the terms and conditions of membership of the Society. He said that he and one or two other Directors had been looking into the matter of their finances, which were now in a rather delicate position because of the very low rate of interest which they could obtain for their funded money. He thought it might be well if a Committee would go into the figures and see how things worked out. They could bring up a full and exhaustive report to a future meeting.

The following gentlemen were appointed a Committee—viz., Sir James H. Gibson-Craig, Bart.; Mr John Speir, Newton Farm, Newton; Mr David Wilson, yr. of Carbeth; Mr Cook, Auditor; and Mr J. Auldjo Jamieson.

DAIRY EXAMINATIONS.

The SECRETARY submitted a letter from the Board of Agriculture, suggesting the appointment of representatives to a conference on the question of securing greater uniformity of method and standard of examinations in dairying. Mr Macdonald said he had also had a letter from Major Craigie, stating that the conference might have a very important bearing on agriculture generally, as well as on dairying.

The CHAIRMAN said he thought they should be represented at the conference.

The Rev. JOHN GILLESPIE said that this was a matter that was dealt with some three years ago. A scheme was, after much correspondence and inquiry, drawn up, and was regarded as fairly satisfactory. The objection to its being carried out was a legal one. It seemed that recently a new position of matters had arisen, and, in the circumstances, a new conference was desired in order to formulate a system for the granting of dairy diplomas.

The Rev. John Gillespie, Mr Alexander Cross of Knockdon, and the Secretary were appointed to represent the Society at the conference.

MEETING OF DIRECTORS, 19TH JUNE 1895.

Present.—Ordinary Directors—Sir Robert Menzies of Menzies, Bart.; Mr Paterson, Hill of Drip; Sir James H. Gibson-Craig of Riccarton, Bart.; Mr Marr, Cairnbrogie; Mr Scott Dudgeon, Longnewton; Captain Clayhills Henderson of Invergowrie, R.N.; Mr Malcolm, Dunmore Home Farm; Mr Cowe, Balhousie; Mr M'Gibbon, Ardnacraig; Mr Hutcheson, Beechwood; Mr Hope, Eastbarns; Mr Wilson, Chapelhill. *Extraordinary Directors*—Mr Wilson, jun., of Carbeth; Mr Aitken, Norwood; Mr Elliot, Hollybush. *Auditor*—Mr Wm. Home Cook, C.A. *Engineer*—Mr James D. Park. Sir James H. Gibson-Craig in the chair.

The SECRETARY reported apologies for the absence of Sir W. S. Walker, K.C.B.; Mr Allan, North Kirkland; Mr Cross of Knockdon; Mr Dudgeon of Cargen; Mr Ferguson, Pictstonhill; Rev. John Gillespie, Mouswald; Mr Gilmour of Montrave; Mr Kirkpatrick, Amisfield; Mr Lockhart, Mains of Airds; Mr Marshall, Lochfergus; Mr Martin of Auchendennan; Mr Sinclair Scott, Burnside.

BLACKFACED WETHERS AND CHEVIOTS NOT ELIGIBLE FOR PRESIDENT'S MEDALS AT DUMFRIES SHOW.

Some discussion took place as to whether Blackfaced wethers and Cheviots were eligible for the President's medals at the Dumfries Show. It was eventually decided that as they were not included under the schedule they could not be allowed to compete.

SITE FOR PERTH SHOW, 1896.

In connection with the Perth Show of 1896, it was remitted to the Directors of the district to look out for a site for the exhibition.

HOTEL ACCOMMODATION.

The CHAIRMAN said he desired to bring another matter under the notice of the Board. They usually looked after themselves, but they never made any provision for getting rooms taken for other members of the Society or for exhibitors. It was too late to do anything in connection with the Dumfries Show, but the matter should be fully gone into at Perth.

Eventually the question of providing hotel and lodging accommodation was remitted to the Directors of the Perth district.

LETTER FROM SECRETARY, ROYAL COMMISSION ON AGRICULTURE.

A letter was read from the Secretary of the Royal Commission on Agriculture, thanking the Society for having placed its offices at the disposal of the Commission during its visit to Edinburgh.

MEETING OF DIRECTORS, 6TH NOVEMBER 1895.

Present.—*Vice-President*—Wellwood H. Maxwell of Munches. *Ordinary Directors*—Mr Paterson, Hill of Drip; Mr Marr, Cairnbrogie; Rev. John Gillespie, Mouswald; Mr Middleton, Clay of Allan; Mr Speir, Newton Farm; Mr Dun, Easter Kincaid; Mr Davidson, Saughton Mains; Mr Cross of Knockdon; Captain Clayhills Henderson of Invergowie, R.N.; Mr Malcolm, Dunmore Home Farm; Captain Robert Dundas, yr. of Arniston; Mr Lockhart, Mains of Airies; Mr Cameron, Balnakyle; the Hon. the Master of Polwarth, Humbie House; Mr McGibbon, Ardnacraig; Mr Hutcheson, Beechwood; Mr Martin, Auchendennan; Mr Hope, East Barns; Mr Maxwell of Kirkennan; Mr Wilson, Chapelhill. *Extraordinary Directors*—Mr Wilson, yr. of Carbeth; Mr Cran, Kirkton; Lord Reay, Carolside; Mr Elliot, Hollybush; Mr Ferguson, Pictstonhill; Mr Glendinning, Hatton Mains. *Chemist*—Dr A. P. Aitken. *Auditor*—Mr Wm. Home Cook, C.A. *Engineer*—Mr J. D. Park. *Veterinary Surgeon*—Principal Williams. Sir James H. Gibson-Craig in the chair.

The SECRETARY reported apologies for the absence of the Right Hon. the Earl of Stair, K.T.; Sir G. Graham Montgomery of Stanhope, Bart.; Mr Dudgeon of Cargen; Mr Scott Dudgeon, Longnewton; Mr Gilmour of Montrave; Mr Gordon of Newton; Mr Macpherson Grant, yr. of Ballindalloch; Mr Kirkpatrick, Amisfield; Mr Lumsden of Balmedie; Mr Maxwell, Terraughtie; Mr Pott of Dod; Mr Sinclair Scott, Burnside.

THE LATE MR GEORGE COWE.

Before beginning the ordinary business, the Chairman intimated the death of one of the Directors, Mr George Cowe, Balhousie.

The SECRETARY read a minute expressive of the regret felt by the Directors at Mr Cowe's death, and recording their sense of the value of his services as a member of the Society for many years, as a Director, and as a member of the Botanical and Chemical Committee during 1894-95.

The CHAIRMAN moved the adoption of this minute. They might not and did not all agree with Mr Cowe on all occasions, but after a battle was over he was as good friends as any one possibly could be. Mr ANDREW HUTCHESON seconded the motion. Mr Cowe was one who held firmly by his convictions, and was a sincere and straightforward man.

Captain CLAYHILLS HENDERSON, as a member for the district which Mr Cowe represented, endorsed every word which had been spoken regarding Mr Cowe. He had been his mentor in agricultural matters.

DUMFRIES SHOW.

The CHAIRMAN, as Convener of the Show Committee, reported that in spite of the very disagreeable weather on the last day of the Show, there was reason to believe the accounts would show a surplus of £690 on the Dumfries meeting. This was a most satisfactory result, and compared very favourably with the result from the previous meeting at Dumfries, when they lost £600. They had £300 more revenue on the last occasion, but since then they had been able to effect sundry economies. He directed special attention to the handsome way in which the district had come forward—the voluntary assessment yielding £1700, which was a much larger sum than they had got from most other districts in Scotland. Very special thanks were due to the Convener of the Local Committee (Mr Wellwood H. Maxwell of Munches), whom they were glad to see present, and the Rev. John Gillespie. He was sure they would allow him to express the very high opinion they entertained of the services of these gentlemen, which had resulted in making the Show a financial as well as an agricultural success.

Mr MAXWELL thanked the Directors for this expression of their feelings. He had done heartily all that he did from the conviction that such Shows were an advantage to the country. They had many districts wealthier than that of Dumfries, and it was some satisfaction to find that they were not behind any other district in which the Show had been held. Looking back half a century, he found that Dumfries stood well even in those days, and gave better results than the metropolis itself.

MISCELLANEOUS.

The CHAIRMAN intimated that, acting on a suggestion made by Mr Martin, competitors would receive the full amount of their prize-money, cheques being made payable upon an account opened in the Society's name in the London branch of the Royal Bank of Scotland.

The amount due as fines for the non-forwarding of stock at last report was £43, of which only £1 was unpaid.

The SECRETARY asked that the stewards of live stock should consult with him regarding some cases in which he had a difficulty. This was agreed to.

Some conversation took place regarding nine cases of the transference of members' tickets. Mr GILLESPIE suggested that the Board should meet in Committee to consider these cases before publishing the names. Mr HUTCHESON was of opinion that any member who transferred his ticket deserved to have his name exposed. The CHAIRMAN thought that should certainly be done if the member was to blame, but generally the plea was that the ticket had been lost. Ultimately the matter was referred to the Board in Committee.

A letter was read from Lord Polwarth complaining that the grass supplied to the cattle had been top-dressed with nitrate of soda, and in consequence, he believed, two of his bulls had been affected in their kidneys. This should not be.

Mr GILLESPIE asked if the matter had been investigated.

Mr W. S. FERGUSON thought it would be a bad job for the nitrate companies if the allegation in the letter was well founded. Mr J. I. DAVIDSON said if forage was expected to be green at that date, it could not be so without nitrate. The CHAIRMAN thought it was a question for the Chemical Committee. Ultimately the matter was departed from.

Mr M. S. M'KERROW, Boreland of Southwick, wrote asking the return of his entry fees under the following circumstances: He had entered seven pens of Cheviots, which on account of the outbreak of a mysterious disorder he had withheld from exhibition. He understood he would have been quite within his right in sending forward the sheep, but he withheld them in the public interest, and at great loss to himself.

Mr MAXWELL believed this was a very peculiar case. The disease had for a time baffled the skill of the veterinarians, and after the way Mr M'Kerrrow had acted in withholding his entries he deserved all consideration.

Mr MARR moved that the money be returned. This was seconded by Mr ELLIOT, and unanimously agreed to.

The SECRETARY reported regarding the machinery trials, which had been successfully carried out so far. At the trials, of turnip-lifters on the farm of the Crichton Institution on Wednesday, the following gentlemen would act as judges: Messrs W. T. Sprout, Borgue House; James Biggar, The Grange; J. Kirkpatrick, Annfield; and the Society's engineer, James D. Park.

These reports were adopted.

. PERTH SHOW, 1896.

The minutes of Committee and correspondence dealing with this Show were read by the Secretary. The Show will be held on the western division of the South Inch, and besides granting the site, the Town Council have given water free of charge. The Council has no fund from which to make a grant towards the Show expenses, but the Town Clerk wrote that the Council would do all in its power to make the Show a success. The date was fixed—July 21, 22, 23, and 24.

The various County Councils within the Show district have agreed to levy a voluntary assessment, and a Local Committee has besides been organised to collect subscriptions. The CHAIRMAN remarked regarding this that if Perth did as well as Dumfries they would be quite satisfied.

The following gentlemen were nominated a Committee to consider and report as to the forage contract—viz.: Messrs D. Buttar, Corston; Andrew Hutcheson, George Dun, Robert Paterson, James I. Davidson, George R. Glendinning, and the Chairman, convener.

Arrangements have been made with Mr Forrester, house-agent, Perth, who will prepare an official list of suitable lodgings, and make appointments for visitors.

The prize-list was remitted to the General Show Committee.

Mr HUTCHESON intimated that the Technical Education Committee of the Perth County Council had given a grant for a horse-shoeing competition confined to Perthshire, and had remitted the arrangements to Mr W. S. Ferguson and himself to carry out.

Mr MARTIN questioned if it was in accordance with their usual custom to have confined classes at their Shows, and after discussion the matter was remitted to the Shows Committee.

BLACKFACED EWES AND GIMMERS.

A petition from thirty-five breeders of Blackfaced sheep praying for the abolition of pens of ewes and gimmers, and substitution of single animals, was remitted to the General Show Committee without remark.

GLASGOW SHOW, 1897.

Minutes were read of a meeting of Directors re-sident in the Glasgow Show District held on 31st July, when the question of securing a suitable site, raising a local fund, and other preliminary details, were discussed. It was also proposed to wait upon the Lord Provost in connection with the subject, to secure a voluntary assessment from the County Councils, and endeavour to secure the attendance of the Prince of Wales or the Duke of York, altering the date, if necessary, to suit their convenience.

BORDER SHOW.

A letter was read from Mr Oliver, asking that the claims of Hawick should be borne in mind when the fixing of the Show site in the Border district was again considered. After remarks from the Chairman and Mr Elliot, Mr GILLESPIE recommended that as this application raised the general question of the Show circuit, those who favoured some change should proceed by way of notice of motion. This was agreed to, and Mr Oliver's letter laid on the table meanwhile.

CHEMICAL AND BOTANICAL.

The SECRETARY read a minute from the Science Committee. It reported that £462, or £100 less than had been placed at the disposal of the Committee, had been expended in experiments during 1895. That day the Committee had discussed the experimental work to be done next year. The Committee recommended that £20 had been voted for trials on turnips, as suggested by the Dundee Farmers' Club; £10 for experiments on top-dressing oats, with a view to the prevention of lodging; £50 for an inquiry into clover-sickness; £150 for experiments on feeding-stuffs for cattle and sheep, to include the effects of food on the production of milk; and £25 for an inquiry into finger-and-toe in turnips.

It was remitted to the Convener of the Committee and Mr Speir, Dr Gibb, and Mr Henderson, with the Chemist and Botanist, to carry out the necessary arrangements.

Mr WILSON asked leave to move a slight addition to this report. In the statement of account there was a grant of about £28 to Mr Milne, Inverurie, for experiments in feeding, &c. This sum merely represented Mr Milne's actual outlay, and included nothing for personal work or loss from animals in carrying out the experiments. His motion was that the gold medal of the Society be awarded to Mr Milne.

The MASTER OF POLWARTH seconded. They had had valuable experiments carried out for two successive years at a small cost by Mr Milne, whose work was worthy of every encouragement.

The motion was agreed to.

PUBLICATION COMMITTEE.

The report of this Committee bore that grants amounting to £25 were recommended for work done in compiling a Catalogue of the Library and preparing an Index of the last seven volumes of the 'Transactions.'

Mr GILLESPIE, in moving the adoption of this report, called attention to the insufficient character of the Library, which was quite unworthy of such a Society. He moved that the Board instruct the Secretary to draw up a list of works which it would be well to have, so that the Library might be really valuable for reference purposes.

OFFICE-BEARERS AND DIRECTORS.

The report of the results of the district nomination meetings was held as read, and after prolonged discussion Mr LOCKHART suggested that the Committee to prepare a list of Office-Bearers and Directors for 1896 should consist of the three members for the Perth district, and one from each of the other districts. This was agreed to, and the following Committee appointed—viz.: Captain Clayhills, Henderson, and Messrs Andrew Hutcheon and George Dun, the Master of Polwarth, Captain Dundas, and Messrs Martin, Lumsden, Lockhart, Cameron, and Cross.

MISCELLANEOUS.

Reports and communications were submitted regarding gardens, Highland industries, a Gaelic dictionary presented to the Society by Sir Donald Currie, M.P., and Mr Nordenfelt's butter-radiator, &c.

Mr GILLESPIE reported in a general way regarding the conference on dairying

examinations and diplomas recently held in London. Nothing definite was resolved upon, but there was a free expression of opinion from the representatives summoned by the Board of Agriculture. The representatives of the Highland Society found themselves in line with the main body, and supported the general idea that the Board of Agriculture should take steps to issue, along with a representative advisory committee, diplomas and certificates which would be of real uniform value over the whole kingdom. Nothing definite had been done, but the matter should not be lost sight of.

RED-WATER IN NORTH QUEENSLAND.

A letter was read from Mr Charles S. Dicken regarding an outbreak of red-water in North Queensland, and asking for any information relative to the successful treatment of the disease. Principal Williams expressed the opinion that the disease was not the same as that which went by the same name in this country. He agreed to frame a reply to the communication on behalf of the Board.

JUDGES SELECTION COMMITTEE.

Mr GILLESPIE reported informally that this Committee had met during the forenoon and agreed upon a report. Their suggestions would be in the hands of the Directors in good time for next meeting, but the report must be considered as private until finally adjusted by the Directors.

MEETING OF DIRECTORS, 4TH DECEMBER 1895.

Present.—*Vice-President*—The Earl of Stair, K.T., Lochinch. *Ordinary Directors*—Mr Sinclair Scott, Burnside; Sir Robert Menzies of Menzies, Bart.; Mr Paterson, Hill of Drip; Sir James H. Gibson-Craig, Bart.; Mr Marr, Cairnbrogie; Rev. John Gillespie, M.A., Mouswald; Mr Middleton, Clay of Allan; Mr Speir, Newton Farm; Mr Dun, Easter Kincaide; Mr Lumsden of Balmedie; Mr Scott Dudgeon, Longnewton; Mr Cross of Knockdon; Captain Clayhills Henderson of Invergowrie, R.N.; Mr Malcolm, Dunmore Home Farm; Mr Lockhart, Mains of Aries; Mr Hutcheson, Beechwood; Mr Martin of Auchendennan; Mr Hope, East Barns; Mr Gordon of Newton; Mr Wilson, Chapelhill. *Extraordinary Directors*—Mr Maxwell, yr. of Munches; Mr Wilson, yr. of Carbeth; Mr Cran, Kirkton; Mr Elliot, Hollybush; Mr Ferguson, Pictstonhill; Mr Glendinning, Hatton Mains. *Hon. Secretary*—Sir G. Graham Montgomery of Stanhope, Bart. *Auditor*—Mr Wm. Home Cook, C.A. *Engineer*—Mr J. D. Park, C.E. *Chemist*—Dr A. P. Aitken. Sir James H. Gibson-Craig in the chair.

The SECRETARY reported apologies for the absence of Sir Robert Jardine of Castlemilk, Bart.; Mr Aitken, Norwood; Mr Cameron, Balnakyle; Mr Davidson, Saughton Mains; Mr Dickson, Dabton; Mr Drew, Craigencallie; Mr Dudgeon of Cargen; Mr Gilmour of Montrave; and Mr M'Gibbon, Ardnacraig.

FUTURE MEETINGS.

The next meeting of Directors was fixed for 8th January 1896, and the general meeting of the Society for the 22d of the same month.

OFFICE-BEARERS.

A Committee recommended that the following gentlemen should be elected office-bearers for 1896: *President*—The Marquis of Breadalbane. *Vice-Presidents*—Lord Balvaird; Sir Robert Menzies of Menzies, Bart.; Colonel Home-Drummond of Blair-Drummond; and Mr Jonathan Middleton, Clay of Allan, Ross-shire. The following were recommended as Extraordinary Directors for Perth district: Lord Provost Dewar, Perth; Lord Kinnaird; W. S. Fotheringham of Murthly; Sir Robert D. Moncreiffe, Bart.; Sir Alexander Munro Mackenzie of Delvine, Bart.; Sir C. E. Adam of Blair-Adam, Bart.; Mr Alexander Macduff of Bonhard; Mr John Ballingall, Dunbog; Mr David Buttar, Corston; Mr Andrew Ralston, Glamis. The following were recommended as the other ten Extraordinary Directors, to be elected because of their known interest in and experience of the business of the Society—viz.: Mr D. Wilson, yr. of Carbeth; Lord Reay; Mr Walter Elliot, Hollybush; Mr W. S. Ferguson, Pictstonhill; Mr G. R. Glendinning, Hatton Mains; Mr R. Sinclair Scott, Burnside; Mr R. Shirra Gibb, Boon; Mr George J. Walker, Portlethen; and Mr W. J. Maxwell, yr. of Munches.

CHAIRMAN OF DIRECTORS.

Mr GORDON of Newton asked if the appointment of the Chairman of Directors did not come under the consideration of the Committee who recommended these gentlemen.

Sir JAMES GIBSON-CRAIG said the appointment of a Chairman of Directors was a matter for themselves.

Mr GORDON then asked leave to move the suspension of the standing orders, with the view of moving a resolution on the question. This being agreed to, Mr Gordon said he approached the subject with great diffidence and trepidation, especially because he thought that their very good friend in the chair had carried on the work with remarkable ability and fairness. He moved that a small Committee should be appointed to consider the appointment of a Chairman of Directors, and that it should bring up a report at a future meeting. He said that he made this motion with the view of keeping them clear of any difficult point that might arise under ordinary circumstances. He pointed out that at the time this office was created it was not to be a permanent one, and he thought it would be more satisfactory both for their Chairman and the whole Board that a Committee should be appointed to consider the matter.

Captain CLAYHILLS HENDERSON seconded, and the motion was agreed to.

The following Committee was appointed to deal with the matter—viz.: Mr Gordon of Newton (Convener); the Rev. John Gillespie, Mouswald; Mr J. M. Martin, Auchendennan; Captain Clayhills Henderson; and Mr W. S. Ferguson.

NEW DIRECTORS.

On the motion of the Rev. JOHN GILLESPIE, seconded by Mr JAMES LOCKHART, Mr R. F. Dudgeon of Cargen was nominated a Director for the Dumfries district, in room of the late Mr Lusk.

Mr GORDON of Newton said he believed it was usually the custom for the Directors of the Show district, represented by a deceased or retiring director, to nominate a gentleman to fill a vacancy at the Board, and therefore he proposed that Mr W. Duthie, Collynie, Tarves, be nominated in room of the late Mr George Cowe, Balhousie.

Mr LUMSDEN of Balmedie seconded.

Mr ANDREW HUTCHESON said he and others came there prepared to propose another gentleman, but seeing the turn matters had taken he would not mention his name. It would have been more unselfish of Mr Gordon and others to have left this matter to the people who came from the district which Mr Cowe represented.

PERTH SHOW, 1896.

Fines.—On the recommendation of the Shows Committee, it was agreed that the fines for absent horses be reduced from 40s. to 20s., as for absent cattle.

Pens of Blackfaced Females.—The Shows Committee recommend that the petition, signed by thirty-five exhibitors of Blackfaced sheep, asking that instead of three animals being shown in the classes for ewes and gimmers, only one animal should be shown, be not given effect to, but that three animals be shown as hitherto.

Mr JOHN M. MARTIN said he understood that the petition was very hurriedly got up in a day or two, and notwithstanding it was signed by nearly all the exhibitors of Blackfaced sheep in the country. The gentlemen present might take it from him, that with the exception of three or four all the leading exhibitors of Blackfaced sheep were represented in that list. He only knew of two gentlemen who were asked to sign the petition and who refused, and they were not by any means strongly opposed to the change. It was said that if they did this with one breed they must do it with the whole. Well, it would be plenty of time to consider these when the exhibitors expressed a desire for a change. The position of Blackfaced stock was very different from that of any other kind of sheep, especially from Leicesters and Shrops., which were largely hand-fed. If they took five Blackfaced ewes from the hill every year to prepare them for show purposes, they were practically making them unfitted to go back again. Then, again, they were horned sheep, and the feeding of the ewes affected the horns of the lambs, and especially of the ram lambs, thus increasing risks in lambing. When there was such a general consensus of opinion among breeders of Blackfaced sheep, they must have very good grounds for their petition.

Mr SINCLAIR SCOTT seconded the motion.

Sir ROBERT MENZIES moved the approval of the Committee's recommendation, and maintained that the exhibition of one ewe only would not be a fair indication of a man's flock.

Mr WALTER ELLIOT, Hollybush, seconded. He said that the ewes that were shown never saw the hill, but were kept in parks all their days. He did not think that the

Society existed for the benefit of members only. It would be detracting from the interest of the Society to confine the pens to single sheep. Moreover, it would lead to their having very few sheep in their exhibition.

Mr W. S. FERGUSON said he remembered the time when they used to have five ewes exhibited, and that was even better than three. He held that one fine animal did not show what the flock was like, because they could get an odd ewe in any stock. The judges in most cases went upon family likeness as much as anything else. Mr Ferguson supported Sir Robert Menzies's motion.

The Rev. JOHN GILLESPIE said he felt bound to support the motion of Mr Martin. This was not a matter that need necessarily continue if it was found to be against the interests of the Society. They had a good chance of trying the experiment with the concurrence of those interested in this class of stock. When such an opportunity occurred, it was well to take advantage of it. His expectation was that they would have a larger entry of Blackfaced sheep if they agreed to the motion of Mr Martin. Probably they would have as many sheep in the Show, and they might expect the entries to be much more widely distributed. The proposal made by Mr Martin was well worthy of a trial.

Mr MARR, as one of the Committee, offered some remarks regarding the reasons which led them to refuse the prayer of the petition, and said it would spoil the Show a good deal if they were to reduce the pens to a single animal.

On a division, 9 supported Mr Martin's motion and 16 that of Sir Robert Menzies. The recommendation of the Committee was therefore adopted.

Special Prizes.—On the recommendation of the Shows Committee it was agreed to accept special prizes of £10 by Mr James Lockhart, Mains of Airies, for the best Clydesdale stallion, and of £25 by Mr Gilmour of Montrave for yearlings got by thoroughbred stallions.

The Tuberculin Test.—Mr GEORGE H. GIBSON CARMICHAEL, Callands, offered prizes of £10 for the best male and female animals respectively of the Aberdeen-Angus breed, not exceeding three years old, bred by exhibitor, and which should have stood the tuberculin test and be pronounced free from tuberculosis. The Committee recommended that the prizes should not be accepted on account of the limitation.

Mr JOHN SPEIR, Newton Farm, moved that the prizes be accepted. He said that while a good many of them might be against the tuberculin test, there were others in favour of it. Mr Speir maintained that while no harm could be done to the animal, great good might result from the use of the test.

Mr ANDREW HUTCHESON had much pleasure in seconding Mr Speir's motion. It was high time that tuberculin had come to the front.

Mr MARR moved the adoption of the Committee's report. The opinion of the Committee was that tuberculin had as yet only reached the trial stage. There were really no fixed conclusions that had been arrived at in so far as the tuberculin test was concerned. They had the statement made to them that after the test had been applied two or three times it failed to react. Then, again, they believed it would place too much power in the hands of unqualified practitioners of veterinary science. Seeing that tuberculin had not been well tried, they would be glad to accept the prize, but not the test along with it.

Mr W. S. FERGUSON thought the test had been absolutely successful, but he questioned whether they should be the first to take it up. That, in his opinion, should be left to the breed societies. Mr Carmichael should be thanked for his offer, and should be told that they could not see their way to accept it with the conditions attached.

Mr SCOTT DUDGEON desired to know how the test was to be carried out. Were they to be at the mercy of any veterinary surgeon?

Mr SPEIR, in reply, said they would require to take the veterinary surgeon's certificate. Mr Marr was quite wrong in saying no special decision had been come to with regard to the tuberculin test. The test had proved quite satisfactory, except, perhaps, in one or two cases. The operation was a very simple one, and could be performed by any veterinary surgeon, or even by themselves, if they just had seen it done once or twice.

A vote was then taken, and Mr Marr's motion was carried by 15 to 5.

Other Prizes.—A prize of £10 was intimated from the Hackney Horse Society for the best Hackney mare or filly. A condition was attached that the prize test and prize money should be the same as last year at Dumfries. The matter was remitted to the Shows Committee.

Sir T. D. GIBSON-CARMICHAEL, Bart., M.P., offered a prize for the best pen of Blackfaced ewes or gimmers. It was intimated that Sir Thomas had agreed, instead of devoting the money to this purpose, it would go for the best Blackfaced ram. This was agreed to.

A sum of £10 was accepted from Mr Stewart, Perth, and others, as prizes for dairy cows.

GLASGOW SHOW, 1897.

The CHAIRMAN intimated that a deputation had waited upon the Lord Provost of Glasgow with reference to the Glasgow Show of 1897. They had been heartily received, and his lordship mentioned that he hoped the Corporation would grant the use of the Green for the Show, and be at least as liberal as in former years in contributing to the funds. It was remitted to the General Purposes Committee to take the necessary steps to endeavour to secure the presence of the Prince of Wales at the Glasgow Show.

CIRCUIT OF THE SHOWS.

On the motion of the CHAIRMAN, it was agreed to appoint a Committee to consider and report as to what changes, if any, should be introduced as to the arrangements for, and the circuit of, the general Shows of the Society.

Invitations for the Show of 1898 were submitted from Berwick, Elgin, Kelso, and Hawick, and these were remitted to the Committee.

The following gentlemen were elected to form the Committee: Sir James Gibson-Craig (Convener), Messrs Jonathan Middleton, W. H. Lumsden, W. S. Ferguson, J. M. Martin, Alexander Cross, Walter Elliot, and the Rev. John Gillespie.

AN AMBULANCE TENT.

It was agreed, on the motion of Mr GORDON, to remit to the Stewards' Committee a recommendation that they should take steps for providing an ambulance tent in the show-ground of the Society.

THE SECRETARY'S SALARY.

The Finance Committee recommended that the salary of the Secretary be increased from £550 to £700 a-year.

The CHAIRMAN, in moving the approval of the recommendation, said that when Mr Macdonald was appointed it was understood that if he was a success his salary would be increased. There was no one who could question his success, and he believed they were all agreed that his remuneration was inadequate for the efficient services which he rendered them. They had considered the matter very fully, and they had compared Mr Macdonald's salary with that of others in similar positions, and they had been led to recommend that the amount paid him should be increased from £550 to £700. Some were of opinion that it should only be raised by £100, but it was thought well to make it £150, in order to set the matter at rest for a considerable period. He did not mean by that that they would not at some future date again consider whether Mr Macdonald was being sufficiently paid.

Mr J. M. MARTIN said, as his name appeared in the agenda as the proposer of a motion to increase the Secretary's salary, he had much pleasure in seconding the adoption of the Committee's report. He had taken the initiative in this matter because he happened to be the convener of the Committee that made the preliminary arrangements when Mr Macdonald was appointed. He thought, therefore, it was fitting that he should second the motion. He might state that the sum which the Committee recommended was exactly the sum he intended to propose.

Mr Macdonald was then called into the room, and the CHAIRMAN, addressing him, said he was happy to inform him the Board had unanimously agreed, in recognition of his success and the efficient manner in which he had performed his duties, to raise his salary to £700.

Mr MACDONALD, in replying, said he very heartily thanked them for this handsome encouragement they had given to him in his work for the Society. While he was able he would endeavour to serve the Society to the best of his ability.

THE APPOINTMENT OF JUDGES.

The following regulations, as recommended by Committee, were adopted with regard to the appointment of judges for the Society's Show: (1) Exhibitors in the various classes of stock shall be invited to nominate judges to act at the Shows of the Society. The final selection of the judge or judges shall rest with the Directors. (2) Every third year exhibitors of live stock at any of the three immediately preceding Shows of the Society shall be invited to nominate persons qualified to act as judges in the classes of stock of which they have been exhibitors, each exhibitor to nominate not more than three persons for each class of stock of which he has been an exhibitor; and every third year the breed societies shall be invited to favour the Society with a list of qualified judges for the respective classes of stock, the number on the list to be twelve for each breed. (3) From the list of persons nominated by exhibitors and breed societies, the Directors shall make the final appointment of judges and reserves by open

voting in the usual manner. Nominations may also be made of persons not on the lists received from exhibitors and breed societies, provided they are supported by two-thirds of the Directors present. (4) The judges shall be appointed at the December or January meeting of the Board. (5) In the invitation to judges to act a condition shall be inserted providing that, in the event of the judge accepting the appointment to act as a judge at the Highland Show, he shall not act as judge of the same class of stock at any other Scottish or English open show, or any Scottish show open to one or more counties held before the Highland Show in the same year.

MISCELLANEOUS.

A Committee was appointed to consider and report as to what action should be taken to secure that the objects of the Fertilisers and Feeding Stuffs Act might be more effectually carried out.

Grants amounting to £374 were voted to district societies.

A letter was read from the Central Chamber of Agriculture requesting the Society to support the representations of a deputation to the Board of Agriculture, in favour of the prohibition of the importation of live stock unless the animals are slaughtered at the port of debarkation. The Rev. JOHN GILLESPIE moved the appointment of a deputation. Mr HUTCHESON, Beechwood, seconded the motion, urging that if they did not get the stores in alive, the whole of the cattle trade from abroad should be a dead-meat trade. The motion was agreed to—the Rev. John Gillespie, Mr Gordon, Mr Ferguson, and Mr Walter Elliot being appointed to the deputation.

MEETING OF DIRECTORS, 8TH JANUARY 1896.

Present.—*Ordinary Directors*—Sir Robert Menzies of Menzies, Bart.; Mr Pater-son, Hill of Drip; Sir James H. Gibson-Craig of Riccarton, Bart.; Mr Marr, Cairn-brogie; Rev. John Gillespie, Mouswald; Mr Middleton, Clay of Allan; Mr Spier, Newton Farm; Mr Dun, Easter Kincaid; Mr Davidson, Saughton Mains; Mr Lumsden of Balmedie; Mr Scott Dudgeon, Longnewton; Mr Cross of Knockdon; Mr Malcolm, Dunmore Home Farm; Mr Cameron, Balnakeil; Mr M'Gibbon, Ardnacraig; Mr Hutcheson, Beechwood; Mr Martin of Auchendennan; Mr Hope, East Barns; Mr Gordon of Newton; Mr Maxwell of Kirkcannan; and Mr Wilson, Chapel-hill. *Extraordinary Directors*—Mr Kirkpatrick, Anisfield; Mr Marshall, Loch-fergus; Mr Wilson, yr. of Carbeth; Mr Cran, Kirkton; Mr Gilmour of Montrave; Mr Elliot, Hollybush; and Mr Ferguson, Pictstonhill. *Chemist*—Dr A. P. Aitken. *Auditor*—Mr William Home Cook, C.A. *Engineer*—Mr James D. Park, C.E. *Veterinary Surgeon*—Principal Williams. Sir James Gibson-Craig in the chair.

The SECRETARY reported apologies for the absence of Sir G. Graham Montgomery of Stanhope, Bart.; Mr Drew of Craigenallie; Mr Dudgeon of Cargen; Mr Fletcher of Rosehaugh; Mr Glendinning, Hatton Mains; Mr Macpherson Grant, yr. of Ballindalloch; Mr Lockhart, Mains of Aries; and Mr Maxwell, yr. of Munches. The minutes of the preceding meeting were confirmed, and intimation of acceptance of office from Directors nominated reported.

FINANCE.

The Finance Committee laid on the table the statement of accounts for 1894-95 and estimate for 1896. The capital of the Society as at 30th November 1895 was £82,699, 14s. 2d., exclusive of £500 at credit of the Tweeddale Gold Medal Fund. The receipts for the year amounted to £11,269, 6s. 7d., and the expenditure to £9041, 7s. 4d., leaving a balance in favour of receipts amounting to £2227, 19s. 3d. The probable surplus from the Dumfries Show, when all accounts are squared, is £695, 8s. 6d. The estimated income for 1896 is £3950, and the estimated expenditure £3734, 19s. These figures are, of course, exclusive of the revenue and expenditure from Perth Show. The report was adopted.

PERTH SHOW, 1896.

The CHAIRMAN submitted the recommendations of the Shows Committee on the prize list, all of which were adopted.

The closing dates for entries are: Implements, Monday, 18th May; live stock Monday, 15th June; and post-entries, Wednesday, 17th June.

Sheep.—Some discussion took place on the proposal to omit the class for old tups of the Blackface breed. Mr MARTIN said it was somewhat of a hardship to do this at that late stage, as many breeders had already begun to feed their rams for the Show. Exhibitors were entitled to receive notice, and it was scarcely fair to take away the prizes which had been in force for several years, and were expected to be continued. The class should be retained for one year more, on the understanding that this would be the last year.

Mr GILLESPIE took the same line, arguing that everything should be done to foster the Blackfaces, which paid more rent than all the other breeds of sheep in Scotland put together.

The CHAIRMAN pointed out that they had only had ten entries in four years—in 1892 one, in 1893 three, in 1894 two, and in 1895 four, and in support of this they had spent £72 of prize-money.

Mr JOHN WILSON seemed to think there was no hardship, but the reverse, in an old ram being compelled to compete with a two-year-old; but Mr Martin pointed out that he was quite mistaken, the disadvantage being all on the side of the aged ram.

Mr JAMES HOPE moved that the class be discontinued, which was seconded by Sir ROBERT MENZIES, and carried.

Highland Industries.—The grant of £40 is continued to the Highland Home Industries Association, on condition that the classes be open to the whole of Scotland, but no prizes will be offered at Perth. Every facility is to be granted to Mrs Traill or others for holding and occupying a stall at the Show, free space and other assistance to be given up to the value of £10.

Sir ROBERT MENZIES did not approve of this proposal, and he proposed that £20 be given as prizes for Highland Industries at Perth, with £10 towards the expenses of the stand. This motion was not seconded, and on the motion of Mr C. M. CAMERON, seconded by Mr JOHN MIDDLETON, the Committee's recommendation was carried.

Dressing Grain.—Mr MIDDLETON moved that a sum of £25 be placed at the disposal of the Show Committee for the institution of a trial in the showyard of a better apparatus for corn-dressing than the old fanners, which had undergone no improvement for many years. Mr WALTER ELLIOT seconded.

Mr HOPE dressed a good deal of corn, and had been able to do so without bringing in anything new. The great difficulty was to get anything for it after it was dressed; the less dressing it got the better nowadays. The motion was agreed to, and the vote granted.

Highland Heifers.—A letter was read from Mr Duncan Shaw, W.S., Inverness, Secretary of the Highland Cattle Society, asking on behalf of the Society that three-year-old Highland heifers be put on the same footing as heifers of corresponding age in other breeds; in other words, that they should be proved in calf within nine months after the Show before the premiums are paid. Mr FERGUSON said it was a reasonable suggestion, and moved its adoption. Mr CRAN seconded, and the motion was agreed to.

Special Prizes.—The Cawdor Challenge Cup for mares, offered by the Clydesdale Horse Society, was accepted, as was also a gold medal (£10, 10s.) by the Hunters' Improvement Society for the best Hunter filly not exceeding three years old. The Shorthorn Society's gold medal for the best Shorthorn bull was also accepted.

Horseless Carriages.—Lord Provost Dewar offered to provide not less than £100 in prize-money for a competition for these machines, provided the Society would arrange for their trials in the showyard.

Mr GILLESPIE thought horseless carriages might be a very good thing, but he failed to see their encouragement lay in their line; they wanted to breed horses. Mr HUTCHESON was of an opposite opinion, and favoured the Lord Provost's proposal.

It was agreed to accept the prize, and the arrangements for the trial were remitted to the Stewards, the Chairman of the Board, the Chairman of the Local Committee, the Lord Provost of Perth, and Mr Park, the Society's Engineer.

Judges and Stewards.—The Chairman intimated that Judges had been appointed that morning in Committee, and the names would be communicated to the press as soon as acceptances were intimated. The following were appointed Stewards: *Horses*—Mr Ferguson. *Cattle*—Mr Gillespie. *Sheep, Swine, &c.*—Mr Elliot. *Grand Stand*—Mr Hutcheson. *Implements*—Messrs Jon. Middleton and G. R. Glendinning. *Forage*—Mr D. Buttar.

Hotel.—It was intimated that the headquarters of the Society are to be the Station Hotel, Perth.

Forage.—On the recommendation of the Forage Committee the contract for supplying forage was given to Mr W. S. Ferguson, and the prices intimated as follows (per imperial stone): Oats, 1s.; crushed oats, 1s. 1d.; barley, 10d.; crushed barley, 11d.; bran, 10d.; oatmeal, 1s. 8d.; oilcake, 1s.; home hay, 10d.; new hay, 8d.; wheat or oat straw, 7d. Mr Ferguson also undertakes the cleaning of the showyard and the carting away of the manure and litter.

SCIENCE COMMITTEE.

The minutes of this Committee dated same day were read. Grants to the Scottish Dairy Institute of £60, and of £50 to the Lectureship in Forestry in Edinburgh University, were recommended and agreed to by the Directors.

A letter was read from Mr J. Harling Turner, Secretary of the Scottish Dairy Institute, relative to dairy diplomas and the action of the Royal Agricultural Society thereon. He believed the pupils of the Scottish Dairy Institute would be glad to enter for the diploma of the Royal Society, the only objection being the expense of going to London for the examinations. Mr Turner's proposal was that, by co-operating with the Royal, the National Society of Scotland might arrange that uniform examinations would be held simultaneously in Scotland and England. What was wanted was uniformity, so that all diplomas might have equal value.

Mr GILLESPIE moved that Mr Turner's suggestion be adopted, and a small Committee appointed to put themselves into communication with the Royal Society, and decide what it would be best to do in the circumstances. This was agreed to, and the following Committee appointed: Messrs Alexander Cross (Convener), John Speir, J. H. Turner, John Gillespie, and David Wilson, jun.

MISCELLANEOUS.

The minutes of the Publications Committee were received and adopted. One essay on the improvement of pastures was accepted for the next volume of the 'Transactions,' and liberty was given to Lawes' Chemical Co., Limited, to reproduce, with acknowledgment, a portion of the report on the Rothamsted experiments published last year.

The new arrangements of subscriptions were finally confirmed—viz.: *Higher subscription*—Annual, 23s. 6d.; life, £12, 12s.; or, after ten annual subscriptions, £7, 7s. *Lower subscription*—Annual, 10s.; life, £5, 5s.; or, after ten subscriptions, £3, 3s.

IMPORTATION OF LIVE STOCK.

Mr A. M. GORDON of Newton reported on behalf of the Committee which went to London that when they met in the metropolis they found themselves face to face with two difficulties. Several of the Directors were present, but the rev. gentleman at the foot of the table, who was the pastor of the sheep, deserted them. He recollected well that Mr Hutcheson, in seconding the appointment of the deputation, had done so on the understanding that the deputation was to argue in favour of a dead-meat trade with foreign countries, and nothing else. He therefore wrote to Mr Hutcheson in order that he might clearly understand his views, and he was kind enough to explain at some length what he meant. Consulting with other friends, who were in London on the same errand, it was urged upon the deputation that to bring forward Mr Hutcheson's suggestions would raise against the proposal which they were sent to support a very great storm indeed, and he therefore was compelled, in justice to the side he was there to support, to raise no new issues. The second difficulty was that when they reached the rooms of the Minister of Agriculture it was found that, through some inadvertence, the Highland Society had been left out altogether, and when the deputies got down to pig-breeders the Scottish contingent thought it was time they were heard. Through the good offices of the Marquis of Huntly and Mr Ernest Clarke this was accomplished, and he was called on (in a very crowded room, where they were packed like herring in a barrel) to say something from the standpoint of that Society. If he had used any terms that hurt any one, although late in the day, he had to express his sincere apologies. He had urged in their name that the restrictions should be made permanent, and trusted his words and their views were not without some effect.

The CHAIRMAN expressed the thanks of the Directors to Mr Gordon and his colleagues for the trouble they had taken. The Chairman reminded the Directors that an election of members took place at the annual meeting on 22d inst.

Precepts for £453, 18s. 4d. were signed by the Chairman, and the meeting separated.

MEETING OF DIRECTORS, 22d JANUARY 1896.

Present.—*Ordinary Directors*—Sir Robert Menzies of Menzies, Bart. ; Mr Paterson, Hill of Drip ; Sir James H. Gibson-Craig of Riccarton, Bart. ; Mr Cross of Knockdon ; Mr Malcolm, Dunmore Home Farm ; Captain Robert Dundas, yr. of Arniston ; the Hon. the Master of Polwarth, Humble House ; Mr Hutcheson, Beechwood ; Mr Hope, East Barns ; Mr Wilson, Chapelhill. *Extraordinary Directors*—Mr Dudgeon, The Grange ; Mr Greig, Rephad ; Mr Elliot, Hollybush ; Mr Ferguson, Pictstonhill ; Mr Glendinning, Hatton Mains. *Chemist*—Dr A. P. Aitken. *Auditor*—Mr Wm. Home Cook, C.A. *Veterinary Surgeon*—Principal Williams. Sir James H. Gibson-Craig in the chair.

The SECRETARY reported apologies for the absence of the Right Hon. Lord Reay, Carolside ; Sir Robert Jardine of Castlemilk, Bart. ; Mr Aitken, Norwood ; Mr Cran, Kirkton ; Mr Davidson, Saughton Mains ; Mr Dickson, Dabton ; Mr Drew of Craigen-callie ; Rev. John Gillespie, Mouswald ; Mr Gilmour of Montrave ; Mr Kirkpatrick, Amisfield ; Mr Martin of Auchendennan ; Mr Maxwell of Munches ; Mr Middleton, Clay of Allan ; Mr Wilson, yr. of Carbeth ; Mr M'Gibbon, Ardnacraig ; and Mr Sinclair Scott, Burnside.

DEATH OF MR ANDREW LUSK.

The Directors resolved to record in the minutes the deep regret with which they have received the intimation of the death of Mr Andrew Lusk, Lochvale, Dumfries, formerly one of their number. The Secretary was instructed to send a copy of this resolution to Mrs Lusk, with an expression of the Directors' condolence in the bereavement which she and the family have sustained.

GENERAL.

It was intimated that the Corporation of Glasgow had made a grant of £250 to the funds of the Show in 1897.

The offer of a grant of one-third of the Hackney premiums for the Perth Show, plus a sum equivalent to the expenses of bringing a hackney judge from England, from the Scottish Committee of the Hackney Horse Society, was accepted with thanks.

It was intimated that Mr T. V. Smith of Ardtornish would give special prizes for groups of Highland cattle, the arranging of the conditions being deferred till next meeting.

Some other formal business was transacted, and the meeting separated.

PROCEEDINGS AT GENERAL MEETINGS.

GENERAL MEETING, 19TH JUNE 1895.

Sir JAMES II. GIBSON-CRAIG of Riccarton, Bart., in the chair.

NEW MEMBERS.

280 new members were admitted, the CHAIRMAN stating that for the three years since Mr Macdonald had been appointed Secretary to the Society they had admitted 1203 new members.

THE DUMFRIES SHOW.

The CHAIRMAN reported that the arrangements were well advanced for the Show of this year, to be held at Dumfries on Tuesday 23d July and three following days. The entries of live stock closed that forenoon, but as yet nothing could be said as to the number of entries in the various sections. It was evident, however, that the show of live stock would be a large one, and thoroughly representative. In the implement department there would also be a large display, and he was glad to be able to say that there was every prospect of a highly successful Show. The Society was greatly indebted to the County Councils of Dumfries, Kirkcudbright, and Wigtown for having agreed to raise a voluntary assessment in aid of the Show fund. This movement was taken up most heartily in the three counties, and he believed it would be found that a very handsome local fund would be raised towards the Show.

THE PERTH SHOW OF 1896.

The CHAIRMAN also stated that some progress had been made with the arrangements for the Show of 1896 to be held at Perth. Lord Balvaird had been appointed Convener of the Local Committee, and with other noblemen and gentlemen was already active in promoting the success of the Show. It was gratifying to be able to say that, following the excellent example so admirably set in the Dumfries Show district, the County Councils in the Perth Show district had been good enough to resolve to raise a voluntary assessment in aid of the Show, as was done in former times by the Commissioners of Supply. Committees would be appointed to supplement the voluntary assessment by means of private subscriptions.

THE SHOW OF 1897.

The CHAIRMAN next reported that, provided satisfactory arrangements could be made financially and in other respects, the Show of 1897 would be held in Glasgow. The Directors had appointed a Committee to negotiate with the district, and it was hoped that arrangements would be made which would result in a successful Glasgow Show in 1897.

THE ROTHAMSTED EXPERIMENTS.

Mr WILSON, Carbeth, stated that, in the absence of the Rev. John Gillespie, he had been asked to lay on the table the volume of the 'Transactions' for 1895. This volume would be found to be one of very special interest. It contained the fullest treatise upon the celebrated Rothamsted experiments that had ever appeared in one publication. It extended to over 350 pages of the 'Transactions,' and was a valuable exposition of the great experimental work which had for more than half a century been carried on at Rothamsted by Sir John Bennet Lawes and Sir J. Henry Gilbert. The treatise had been prepared for the Society by Sir John Lawes and Sir J. H. Gilbert themselves, and the Publications Committee felt that the Society was in no ordinary way honoured and complimented by the great services which these celebrated scientists had rendered to its members.

The CHAIRMAN moved a special vote of thanks to Sir John Lawes and Sir J. H. Gilbert for their valuable treatise on the Rothamsted experiments, and this was heartily accorded.

REPORT OF CHEMIST.

Dr AITKEN reported as follows:—

In the volume of the 'Transactions' just published is given a condensed account of the experimental work undertaken by the Society's Chemical Department during the past year. I will not occupy the time of the meeting with any detailed reference to it, but I would beg leave to draw attention to one or two points of outstanding importance. In the report there will be found an account of observations made, and the results obtained, by the application of various manures to permanent meadow at Pumphurst. The field on which the Society's experiments had been conducted for fifteen years, during which manures of a definite kind had been persistently applied year by year to the various plots, was pastured by a mixed stock of horses and cows; and observations were made during the summer with the view of seeing whether the stock would show a preference for some parts of the field over others, corresponding to the various plots which had been so differently manured. In the annual reports of the station will be found an accurate account of the quantities of the various crops grown on the various plots, and also of their feeding quality, in so far as that could be determined by chemical investigations. Last year, for the first time, the stock themselves were permitted to give their opinion of the relative goodness of the grass grown on the plots which had been differently treated. It was evident from the first that it was not the strength of the crop or its quality which attracted them. They selected certain plots, and visited them every day until they were eaten bare to the ground, and passed over other plots where abundance of grass was growing, and which, to the human eye, seemed excellent pasture. As the grass on the favourite plots became scarcer, the stock turned their attention to those next in order of attractiveness, and a valuable lesson was thus taught beyond that which can be attained by means of chemical and botanical analysis. For the details I must refer those interested in that very important subject to the estimates given in the report; but I may here say, in a sentence, that the plots which the stock preferred were those which had in the past been treated with manures whose nitrogen was of the slowly acting kind, derived from animal sources, such as bone-meal, fish-guano, dried blood, and bone-dust, and the plots to which potash salts had been applied, and which were richest in clover. I would also refer, in a few words, to two feeding experiments—one carried out on a large scale with cattle by Mr John Milne at Mains of Laithers, and another of a similar kind with sheep by Mr Adam Logan at Ferny Castle. The object in view was to discover whether the results attained by the use of linseed-cake as a by-fodder could be attained as certainly, and more economically, by the use of other concentrated fodders of nearly similar composition, and chiefly to see how dried grains, which are now being manufactured in large quantities, compared with these feeding stuffs in feeding quality. The result has been to show that quite as good results as those got from feeding with linseed-cake can be got by the use of other substances at a greatly reduced cost, and that among these dried grains holds a very high place. The local field experiments last year were conducted on a very large scale, and in very widely different parts of the country. Unfortunately the weather, especially in the northern counties, where most of the experiments were laid down, was most disastrous, and interfered greatly with the work; nevertheless, much useful information was obtained, and embodied in the report, copies of which, published in separate form, were sent to every one who had taken part in the experiments. There is only one other matter to which I would here refer, and that is the almost entire failure, so far as my experience goes, of the Fertilisers and Feeding Stuffs Act as a means of inducing farmers to have their purchases of manures and feeding stuffs put under analytical control, and as a means of enabling them to have

that done at a trifling cost. One unfortunate result of the passing of the Act has been the suppression of some of the most active of the analytical associations, and the abandonment of the useful educational work in which they were engaged.

Mr HUTCHESON, Beechwood, Perth, said he desired to take exception to the remark of Dr Aitken as to the Fertilisers and Feeding Stuffs Act. He did not know to which part of the country Dr Aitken referred, but his remarks certainly did not apply to Perthshire at any rate. He happened to be convener of the committee in that county, and they had analysed upwards of fifty samples. In regard to the suggestion that the Act was extinguishing local analytical associations, that was contrary to their experience in Perthshire altogether, because they had dovetailed the Act into their analytical and farmers' clubs, and they found that it worked most successfully, and strengthened these clubs in every possible way. Dr Aitken in his report had said that he was only giving his own opinion; he (Mr Hutcheson) would not like it to go forth as the opinion of the Society. They had only to go to official statistics to find that Scotland compared very favourably with England in regard to the advantage taken of the Act.

Colonel STIRLING of Kippendavie spoke in the same terms as Mr Hutcheson.

Captain CLAYHILLS HENDERSON said in Forfarshire the farmers took very great advantage of the Act, and derived great benefit from it.

Mr JOHN MARR, Cairnbrogie, said in Aberdeenshire the farmers' experience for a long number of years had been such as to give them complete confidence in the integrity and the high character of the merchants and companies supplying them with manures. They knew that they were treating with men who were above suspicion, and they simply thought it would be an act of supererogation to go beyond the merchants' analyses.

Mr SCOTT DUDGEON, Longnewton, said he had been of the opinion of Dr Aitken, but he was glad to find that the opinion was not well founded, so far as some parts of the country were concerned. It was, however, within his own knowledge that in Roxburghshire and Berwickshire the Act had been entirely a dead letter. He had been under the impression that the Act had done a great deal of harm instead of good, and he was delighted to hear that in several counties the facts were otherwise.

Mr COWE, Balhousie, said in the Arbroath district the local club went on quite independently of the Act, and they thought they could manage their affairs just as well as the Perth people could.

Dr AITKEN said, in making the observation, he was entirely guided by his own experience. He could point to several counties in Scotland, not the least important, where there had been practically nothing done under the Act, and where excellent associations had discontinued their work with the view, he presumed, of not interfering with what the Government had done through their Act.

The CHAIRMAN pointed out that the opinions expressed in the chemical report were only those of Dr Aitken, and not of the Board of Directors. The only comment which he would make on the report was to say that when Dr Aitken had anything to recommend to the Society for adoption, he should first bring it before the Chemical Committee, who had charge of the work, and not spring it upon the general meeting without notice.

BOTANICAL REPORT.

Mr A. N. M'ALPINE, Botanist to the Society, reported that during the past season he had examined 280 samples of grass and clover seeds, and that, as a rule, they were of the very best quality, the purity being rarely under 97 per cent.

AGRICULTURAL EDUCATION.

Mr JOHN MARR reported that the annual examination of candidates for the Society's diploma and certificate was held on the 20th, 21st, and 22d March. The number of candidates who presented themselves was 26, and the result was that 7 obtained the diploma and 12 the certificate. Mr Marr also announced that the £10 given in prizes to the class of agriculture in the University of Edinburgh had this year been awarded to Arthur Allsebrook, Wollaton, Nottingham, £6; and Samuel Milligan, Hayfield, Dumfries, £4.

FORESTRY DEPARTMENT.

Sir ROBERT MENZIES reported that the Forestry examinations were held on 18th and 19th March. Five candidates came forward, and the result was that two obtained the first-class certificate and two the second-class certificate.

This was all the business.

GENERAL MEETING IN THE SHOWYARD AT DUMFRIES,
24TH JULY 1895.

His Grace the DUKE OF BUCCLEUCH, the President, in the chair.

Mr ANDREW HUTCHESON, Beechwood, Perth, in proposing a vote of thanks to the Provost, Magistrates, and Town Council of Dumfries for the accommodation they had given the Society in the holding of the Show at Dumfries, said he believed they and the neighbouring counties had contributed very liberally to the funds, and he hoped the counties in Scotland would follow the example of Dumfriesshire in levying a voluntary assessment for the support of the Show. Every one who visited the Show must be satisfied with it. The show of horses and cattle could not be beaten in any part of the world.

Mr JOHN SPIER of Newton, Canibuslang, proposed a vote of thanks to the subscribers to the fund in aid of the Show, and to the donors of the special prizes for their liberal support. He directed attention to the fact that the County Councils of the district had been asked to do what the old Commissioners of Supply were in the habit of doing—namely, to put on a voluntary assessment for the purpose of raising funds to help to pay the expenses of the Show. Dumfriesshire and the other counties had done so, and their efforts had met with very liberal support. In Kirkcudbright the whole assessment would have come to £400, and they had raised £390. Dumfriesshire had raised nearly £1000, and Wigtonshire £155. The same course ought to be followed by the counties of the other districts in Scotland in which the Show was periodically held.

Mr A. M. GORDON of Newton, Aberdeenshire, proposed a vote of thanks to the District Committee and to Mr Maxwell of Munches, its Convener. In Mr Maxwell they had a unique local convener, because he had attended every Show of the Society held at Dumfries. He began his career of service to the Society so long ago as 1830. He attended the Show and the historical banquet in Dumfries in 1837, and he attended the Shows in 1845, 1860, 1870, 1878, and 1886. Now he was their local convener in 1895, and he hoped when they returned to Dumfries they would still have that magnificent old gentleman in the same position.

Mr MAXWELL, who in responding to the vote of thanks was very cordially received, said he would not envy the man who could stand in that position and remain unmoved. He had received many compliments and many honours in his day, but he honestly told them that there were few or none that he prized more than that which the Society had conferred upon him. He did not hesitate to say that he had taken an interest in the proceedings not only of that Society but of the local agricultural societies, because he had learnt from his earliest days the advantage of such societies to the country. He had done no more for the Society than was the duty of every proprietor in the country. As a matter of fact, he had had very little to do, the reason being, of course, that affairs were so well managed at headquarters that little was left for the local committee to do. At any rate, his exertions had been trifling compared with those of the Rev. Mr Gillespie, whose services to promote agriculture in that district, and indeed over the length and breadth of Scotland, were well known. Referring to the work of the Royal Commission on Agriculture, he said the Highland Society, with its direction of practical men from every part of Scotland, should be able, if any body were able, to devise something for the good of agriculture; and he called upon the Society to be up and doing, and to show that if anything were to be done, they should be able to thank themselves, and not any Commission or Committee.

Mr FERGUSON, Pictouhill, moved a vote of thanks to the railway companies for the facilities they had provided in connection with the Show.

Sir JAMES GIBSON-CRAIG moved a vote of thanks to the President. It had been, he said, a great satisfaction to them to have the Duke of Buccleuch once again President of the Society. The Duke had taken a keen interest in the Society and in agriculture generally, and all of them congratulated him on being able to be present that day.

The CHAIRMAN, in acknowledging the vote of thanks, said he was glad to be able to follow in the footsteps of his father, who took a great interest in agriculture. He could assure them that no one took a greater interest in everything concerning farming than he himself did. He did not pretend to have the practical knowledge of many of those present, but when he went about he kept his eyes open and was glad to pick up information whenever he could. He congratulated them on the exhibition which the Society had brought together on that occasion. It was an unfortunate circumstance, so far as the Show was concerned, that the general election was going on at the same time. That would keep some people away from the Show; but of course at intervals the country must go through these periods. Notwithstanding that circumstance, he was glad to be able to inform the meeting that up to noon that day the

drawings at the gates were £332, against £418 for a corresponding period of the second day at Aberdeen, so that they were not so very far behind after all. They had at the Show a very great collection of stock exhibited. It was sometimes thrown in the teeth of agriculturists that they were a despondent set of people, and yet that they were able to show stock of extraordinary good quality and in the best condition. That, he held, said a very great deal for the agriculturists of the country. It showed that they were putting their shoulder to the wheel and were doing their very best in their position to help themselves, and the least the farmers and the agricultural classes could expect was that the country should look upon them with favour and endeavour to find a way of assisting the farming industry.

The proceedings then terminated.

ANNIVERSARY GENERAL MEETING, 22D JANUARY 1896.

The DUKE OF BUCCLEUCH in the chair.

NEW MEMBERS.

Seventy-three candidates were balloted for and elected as members.

The SECRETARY intimated that the Directors recommended the following noblemen and gentlemen for election to fill the vacancies in the list of office-bearers: *President*—The Marquis of Breadalbane, K.G. *Vice-Presidents*—Lord Balvaird, Scone Palace; Sir Robert Menzies of Menzies, Bart.; Col. H. S. Home-Drummond of Blair-Drummond; Jonathan Middleton, Clay of Allan. *Ordinary Directors*—Charles Howatson of Glenbuck; Sir Ralph Anstruther of Balcaskie, Bart.; Robert Paterson, Hill of Drip; Sir James H. Gibson-Craig of Raccarton, Bart.; John Marr, Cairnbrogie; Rev. John Gillespie, Mouswald; John Cran, Kirkton; C. H. Scott Plummer of Sunderland Hall; Robert F. Dudgeon of Cargen, in place of Andrew Lusk, Lochvale, resigned; John Macpherson Grant, yr. of Ballindalloch, in place of the late C. Macpherson Grant of Drumduan; William Duthie, Collyme, in place of the late George Cowe, Balhousie. *Extraordinary Directors*—John A. Dewar, Lord Provost of Perth; Lord Kinnaird, Rossie Priory; Sir Robert D. Moncreiffe of Moncreiffe, Bart.; Sir Alexander Muir Mackenzie of Delvine, Bart.; Sir C. E. Adam of Blair-Adam, Bart.; W. Steuart Fotheringham of Murthly; Alexander Macduff of Bonhard; John Ballingall, Dunbog; David Buttar, Corston; Andrew Ralston, Glamis; David Wilson, yr. of Carbeth; John Gilmour of Montrave; Lord Reay, Carolside; Walter Elliot, Hollybush; W. S. Ferguson, Pictstonhill; George R. Glendinning, Hutton Mains; W. J. Maxwell, yr. of Munches; R. Sinclair-Scott, Burnside; George J. Walker, Portlethen; R. Shirra Gibb, Boon.

Mr JOHNSTON of Sands said that in the selection of Extraordinary Directors there seemed to have been a great favouritism shown for the Perth district, while Kinross-shire was represented by Sir Charles Adam, who was seldom in Scotland. He would suggest that as the city of Perth was very well represented, Mr Macduff of Bonhard would retire, and he would nominate Mr Wm. Drysdale of Kilbue in his place.

This amendment was not seconded, and therefore the election of the above-named office-bearers was declared carried unanimously.

VOTE OF THANKS TO THE DUKE OF BUCCLEUCH.

Mr DUDGEON, Cargen, moved the following resolution—viz.: "That the heartiest thanks of the Society be given to his Grace the Duke of Buccleuch and Queensberry, K.T., for his valuable services to the Society as its President for the past year, and for the kindly and active interest which his Grace has always manifested in the work and welfare of the Society."

Sir MARK J. STEWART seconded the motion, which was carried unanimously.

The DUKE OF BUCCLEUCH briefly acknowledged the vote of thanks.

FINANCE.

Mr JAMES AULDJO JAMIESON submitted the Accounts for the past year. It was gratifying to observe that the Society had had a successful year financially. The gross income of the Society for the year was £11,269, and that sum exceeded the outlays by £2227, including a credit balance of £695 from the Dumfries Show. During the past year 363 new members had been admitted, and that, to a large extent, accounted for the satisfactory state of the Accounts for the year.

The report was adopted.

ARGYLL NAVAL FUND.

Sir ROBERT MENZIES submitted the Accounts of the Argyll Naval Fund for 1894-95, which showed that the income for the year amounted to £237, 6s. 2d., from which four recipients received each an allowance of £40, and two an allowance of £20 each, making the total expenditure £200. No vacancies had occurred during the past year in the list of beneficiaries.

DUMFRIES SHOW, 1895.

Sir JAMES H. GIBSON-CRAIG submitted the report on the Show of 1895 held at Dumfries. In spite of extremely unfavourable weather the Show had been a financial success, leaving as it did a balance to the good of about £695, as compared with a loss of about £677 on the Dumfries Show in 1886. This gratifying result was in a large measure due to the very handsome manner in which the counties of Dumfries, Kirkcudbright, and Wigtown, and the town of Dumfries had supported the Show by raising a local fund of no less than £1700. In other respects the Society had received most cordial assistance and encouragement from the Show district, and no one was more active or more helpful in promoting the success of the Show than Mr Maxwell of Munches, who had attended every one of the seven Shows of the Society held at Dumfries, and who again filled the office of Convener of the Local Committee.

The report was cordially approved of.

PERTH SHOW, 1896.

Sir JAMES H. GIBSON-CRAIG reported that the Show of this year would be held at Perth on Tuesday, the 21st July, and three following days. The town of Perth had been good enough to give them an admirable site, free of rent, on the South Inch, and he was glad to say the Society was in other respects receiving the hearty support of the Lord Provost and Town Council in promoting the success of the Show. The various County Councils in the Show district had in the most cordial manner agreed to revive the practice of the Commissioners of Supply of raising a local fund in aid of the Show by means of a voluntary assessment on owners of lands and heritages, and for this handsome support the Society was deeply indebted. The prize-list would be similar to that for recent years, and they had every reason to hope that the Show would in every respect be a highly successful one.

Mr HOWATSON, Glenbuck, said there was a very general hope in the west that H.R.H. the Prince of Wales should honour the Glasgow Show in 1897 by his presence. He would ask what was being done in the way of inducing H.R.H. to visit the Show.

Sir JAMES GIBSON-CRAIG said the matter had been submitted to the General Purposes Committee, and he was sure that Committee would have the cordial co-operation of Scottish agriculturists in the way of trying to incline H.R.H. to visit the Show when it was held at the second city of the empire.

The report was approved of.

DISTRICT SHOWS AND COTTAGES AND GARDENS.

The MASTER OF POLWARTH submitted the report on district competitions, showing that in 1895 193 districts participated in grants of money and medals. A gold medal was awarded to W. D. Mackenzie of Farr, Inverness, for cottages erected in 1893 and 1894. The total expenditure under this head amounted to £347, 13s. 4d. For the current year the Directors proposed the following grants: (1) Under section 1, nine districts for grants of £12 each for cattle, horses, and sheep, and seven districts in intermediate competition with a grant of three medals to each; (2) under section 2, eight districts for grants of £15 each for stallions; (3) twenty districts, two medals each; (4) ploughing competitions, 160 medals; (5) cottages and gardens, twenty-two districts, two medals each. The Board also recommend the following special grants—viz.: £40 to the Highland Home Industries and Arts Association, £20 to the Kilmarnock Dairy Produce Show, £5 to the Shetland Agricultural Society, and £3 each to Orkney, South Uist, Barra, and North Uist. The total sum recommended to be given in 1896 amounts to £375, 17s. 4d.

ADMISSION OF LIFE MEMBERS.

Sir JAMES H. GIBSON-CRAIG, Bart., submitted changes in the by-laws governing the admission of life members. The matter has already been before the Board, and the action of the Directors was unanimously approved.

CHEMICAL AND BOTANICAL.

Mr HUTCHESON, in the unavoidable absence of the Convener through family illness, reported on the work of the Chemical and Botanical Departments during the past year, and explained the scheme of operations for the current year. The severe and long-continued frost of the last winter prevented the Committee from carrying out an arrangement made for a series of analyses of different varieties of turnips, but it is hoped that the investigation will be conducted this winter. Experiments were made last year in the top-dressing of oats with the view of preventing lodging. An important series of experiments in the fattening of cattle were conducted for the Society by Mr Milne, Mains of Laithers, Aberdeenshire; while, by desire of the Committee, Mr John Speir carried out further trials in regard to the effects of food on the milk of cows. Experiments were also made in the prevention of potato disease by dressing with the Bordeaux mixture, and with Driffield's disease-resisting turnip-seed, and the results of all these experiments, in so far as completed, will be published in the forthcoming volume of the 'Transactions.' Experiments were begun last year on the qualities of different varieties of clover-seeds, on clover-sickness and tulip-root, and on finger-and-toe in turnips. All these will be continued in the current year, and will be conducted with the joint assistance of the Society's Chemist and Botanist. Great importance is attached to experiments upon the feeding of different classes of stock, and it has been decided to devote a good deal of attention to these this year.

The Society has arranged with Mr Milne, Mains of Laithers, to conduct a feeding experiment on a large scale. Its object is twofold—to test the value of the albuminoid ratio as a guide in practical feeding, and to test the relative economy of some of the concentrated fodders in common use. There are fifty cattle engaged in the experiment, divided into five lots of ten each, and fed in the following manner:—

Lot 1. Decorticated cotton-cake.

Lot 2. Linseed-cake.

Lot 3. A mixture of decorticated cotton-cake and brewers' grains.

Lot 4. Barley-bran.

Lot 5. A mixture of maize and oats.

These fodders are supplied to the cattle in quantities of equal money value. Lot 1 is a by-fodder rich in albuminoid substances and of a narrow ratio. Lots 4 and 5, a much less albuminoid fodder, having a wide ratio; and lots 2 and 3 are intermediate. The whole experiment is under analytical control, so as to yield further information regarding the digestibility of the fodders employed. The other fodder is limited to turnips, 50 lb. per head per day over all, and straw *ad libitum*, but supplied in weighed quantities, so that careful note is kept of the quantity of straw consumed by each lot.

A similar experiment is being carried out with sheep by Mr Adam S. Logan, Ferney Castle, Reston, and by Mr A. G. Spence, Whitelaw, Edrom. At each farm there are our lots of sheep of ten each—viz., lots 2, 3, 4, and 5, as already described. The uncertain results obtained in 1884-85 with Driffield's disease-resisting Achilles turnip-seed rendered it desirable to have this seed retested during last season, and for that purpose parcels of seed were sent to a dozen different farms. The reports which have come to hand are, upon the whole, very favourable. On several farms where, owing to the ravages of finger-and-toe, the turnip crop was an entire failure, the plants grown from Driffield's Achilles turnip-seed remained sound and were a fair crop. It is anticipated that further information will be obtained regarding the keeping qualities of the turnip.

It will be seen from the abstract of the accounts for the past year that the Committee has kept its promise to be careful in outlays, the actual sum expended in the Chemical and Botanical Departments being £433, as compared with £753 in the preceding year. It is not expected that the expenditure in the current year will exceed the outlays of last year. It has been found that the number of samples of manures and feeding stuffs sent by members for analyses by the Society's Chemist has not fallen off appreciably since the passing of the Fertilisers and Feeding Stuffs Act, 1893. The Directors have been watching with interest the operations of that Act, and have appointed a Committee to consider and report as to what action, if any, should be taken to ensure that the objects of the Act may be more effectively carried out.

The report was approved of.

BOTANICAL REPORT.

Professor M'ALPINE reported as follows:—

I have the honour to report that during the past year I have examined over 500 samples of grass, clover, mangold, turnip, and cabbage seeds. Taken as a whole, the seeds sent in for examination were of the very best quality, of very vigorous germination, and very pure; indeed, on the average, the seeds examined were the best that

have ever passed through my hands. Evidently farmers are beginning to realise more and more that seed of best quality—that is, of highest germinating power and purity—is an important factor of success and profit.

To show the germinating power of some of the best samples, the following figures are given: *Percentage of germination*—Red clover, 97; alsike clover, 98; white clover, 97; trefoil, 95; Italian ryegrass, 98; perennial ryegrass, 98; meadow-fescue, 93; timothy, 100; cocksfoot, 96; rough-stalked meadow-grass, 91; crested dogstail, 91; meadow foxtail, 80. A number of grasses, weed-plants, and weed-seeds were also sent in for identification.

Mr FERGUSON, Pictstonhill, said that before they passed from the scientific part of the business he wished to take exception to what had been said in the chemical report as to the disease-resisting properties of the Driffeld turnip. He was one of those who carried out this test, and he found the yellow turnips were as good as the crop of Driffelds growing alongside them.

The subject then dropped.

GRANTS FOR EDUCATION.

Mr JOHN WILSON stated that the Directors recommended that the following grants be renewed for the current year—viz.: (1) £60 to the Scottish Dairy Institute, and (2) £50 to the Lectureship on Forestry in the University of Edinburgh.

Sir ROBERT MENZIES, in supporting the renewal of the grant of £50 for the Forestry Lectureship, stated that subscriptions were still being received for the endowment of the Chair of Forestry in the University of Edinburgh. The Society had last month paid over the sum of £190 to the University, making a total of £821 contributed through the Society, in addition to a donation of £1000 given by a late member of the Society.

The grants were agreed to.

DATE OF EXAMINATIONS.

Mr JOHN WILSON stated that the examinations for the Society's diploma and certificate in Agriculture and Forestry had been fixed to take place on Tuesday, 7th April, and three following days.

THE VETERINARY DEPARTMENT.

Principal WILLIAMS briefly reported the progress he had made in his investigation as to louping-ill. He expected that he would in the course of the present year be able to complete his investigation, and prove that the tick was the cause of the disease. He might mention that a friend of his (Mr Henry Thompson, M.R.C.V.S., Aspatia), who was greatly interested in this question, had presented a farmer with 20 tons of crushed rock-salt to be spread on the land which was badly affected. That farmer called upon him the day before, and said that at first he thought the pasture had been ruined, but now it was coming up better than ever.

Professor WALLACE said he could support the views of Principal Williams in regard to tick being the cause of the disease. He had learned, in the course of his travels in South Africa and Queensland, that the tick was not only the cause of louping-ill, but was also the cause of red-water in cows, and it was believed there that it frequently caused the death of children.

The subject then dropped.

'TRANSACTIONS.'

Mr G. R. GLENDINNING reported that no awards for reports had been made during the year. The volume of the 'Transactions' for the current year was in preparation, and he was glad to say that several very interesting and useful papers had been obtained for that volume.

APPENDIX.

PREMIUMS

OFFERED BY

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND IN 1896.

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GENERAL NOTICE.

THE HIGHLAND SOCIETY was instituted in the year 1784, and incorporated by Royal Charter in 1787. Its operation was at first limited to matters connected with the improvement of the Highlands of Scotland; but the supervision of certain departments, proper to that part of the country, having been subsequently committed to special Boards of Management, several of the earlier objects contemplated by the Society were abandoned, while the progress of agriculture led to the adoption of others of a more general character. The exertions of the Society were thus early extended to the whole of Scotland, and have, for the greater part of a century, been directed to the promotion of the science and practice of agriculture in all its branches.

In accordance with this more enlarged sphere of action, the original title of the Society was altered, under a Royal Charter, in 1834, to THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

The leading purposes of the Institution are set forth in the following pages, where it will be found that Premiums are offered for Reports on almost every subject connected with the cultivation of the soil; the rearing and feeding of stock; the management of the dairy; the improvement of agricultural machinery and implements; the growth of timber; the extension of cottage accommodation; the application of chemical science; and the dissemination of veterinary information.

Among the more important measures which have been effected by the Society are—

1. Agricultural Meetings and General Shows of Stock, Implements, &c, held in the principal towns of Scotland, at which exhibitors from all parts of the United Kingdom are allowed to compete.
2. A system of District Shows instituted for the purpose of improving the breed of Stock most suitable for different parts of the country, and of aiding and directing the efforts of Local Agricultural Associations.
3. The encouragement of Agricultural Education, under powers conferred by a supplementary Royal Charter, granted in 1856, and authorising "THE COUNCIL of the HIGHLAND AND AGRICULTURAL SOCIETY ON EDUCATION" to grant Diplomas to Students of Agriculture; and by the establishment of Bursaries. The Bursaries were discontinued in 1892.
4. The appointment of a chemist for the purpose of promoting the application of science to agriculture, and to superintend local experiments.
5. The advancement of the Veterinary Art, by conferring Certificates on Students who have passed through a prescribed curriculum, and who are found, by public examination, qualified to practise. Now terminated in accordance with arrangements with the Royal College of Veterinary Surgeons.
6. The establishment of a Botanical Department.
7. The establishment of a Dairy Department.
8. The appointment of a Board of Examiners, and the granting of First and Second Class Certificates in Forestry.
9. The annual publication of the 'Transactions,' which comprehend papers by selected writers, Prize Reports, and reports of experiments, also an abstract of the business at Board and General Meetings, and other communications.
10. The management of a fund left by John, 5th Duke of Argyll (the original President of the Society), to assist young natives of the Highlands who enter Her Majesty's Navy.

CONSTITUTION AND MANAGEMENT.

The general business of THE HIGHLAND AND AGRICULTURAL SOCIETY is conducted under the sanction and control of the Royal Charters, referred to above, which authorise the enactment of Bye-Laws.

The Office-Bearers consist of a President, Four Vice-Presidents, Thirty-two Ordinary and Twenty Extraordinary Directors, a Treasurer, an Honorary and an Acting Secretary, an Auditor, and other Officers.

The Council on Education, under the Supplementary Charter, consists of Sixteen Members—Nine nominated by the Charter, and Seven elected by the Society. The Board of Examiners consists of Sixteen Members.

PRIVILEGES OF MEMBERS

MEMBERS OF THE SOCIETY ARE ENTITLED—

1. *To receive on application a free copy of the 'Transactions' annually.*
2. *To apply for District Premiums that may be offered.*
3. *To report Ploughing Matches for Medals that may be offered.*
4. *To Free Admission to the Shows of the Society.*
5. *To exhibit Live Stock and Implements at reduced rates.¹*
6. *To have Manures and Feeding-Staffs analysed at reduced fees.*
7. *To have Seeds tested at reduced fees.*
8. *To have Diseases affecting Farm Crops inquired into.*
9. *To attend and vote at General Meetings of the Society.*
10. *To vote for the Election of Directors, &c., &c.*

ANALYSIS OF MANURES AND FEEDING-STUFFS

The Fees of the Society's Chemist for Analyses made for Members of the Society shall, until further notice, be as follow:—

| | | | | |
|--|---|---|---|------|
| The estimation of one ingredient in a manure or feeding-stuff | : | : | : | 5s. |
| The estimation of two or more ingredients in a manure or feeding-stuff | : | : | : | 10s. |

These charges apply only to analyses made for the sole and private use of Members of the Highland and Agricultural Society who are not engaged in the manufacture or sale of the substances analysed.

The Society's Chemist, if requested, also supplies valuations of manures, according to the Society's scale of units.

EXAMINING SEEDS, CROP DISEASES, &c.

The rates of charge for the examination of plants and seeds, crop diseases, &c., will be had on application to the Secretary.

ELECTION OF MEMBERS

Candidates for admission to the Society must be proposed by a Member, and are elected at the half-yearly General Meetings in January and June. It is not necessary that the proposer should attend the Meeting.

CONDITIONS OF MEMBERSHIP

The ordinary subscription is £1, 3s. 6d. annually, which may be redeemed by one payment, varying, according to the number of previous annual payments, from £7, 1s. to £12, 12s. Proprietors farming the whole of their own lands, whose rental on the Valuation Roll does not exceed £500 per annum, and all Tenant-Farmers, Secretaries or Treasurers of Local Agricultural Associations, Factors resident on Estates, Lund Stewards, Foresters, Agricultural Implement Makers, and Veterinary Surgeons, none of them being also owners of land to an extent exceeding £500 per annum, are admitted on a subscription of 10s. annually, which may be redeemed by one payment, varying, according to the number of previous annual payments, from £3 to £5, 5s.² Subscriptions are payable on election, and afterwards annually in January.

Members are requested to send to the Secretary the names and addresses of Candidates they have to propose (stating whether the Candidates should be on the £1, 3s. 6d. or 10s. list).

JAMES MACDONALD, *Secretary.*

3 GEORGE IV. BRIDGE, EDINBURGH.

¹ Firms are not admitted as Members; but if one partner of a firm becomes a Member, the firm is allowed to exhibit at Members' rates.

² Candidates claiming to be on the 10s. list must state under which of the above designations they are entitled to be placed on it.

ESTABLISHMENT FOR 1896.

President.

THE MARQUIS OF BREADALBANE, K.G.,
TAYMOUTH CASTLE, ABERFELDY.

Vice-Presidents.

LORD BALVAIRD, Scone Palace, Perth.
SIR ROBERT MENZIES of Menzies, Bart., Farleyer, Aberfeldy.
COLONEL H. S. HOME-DRUMMOND of Blairdrummond, Stirling.
JONATHAN MIDDLETON, Clay of Allan, Fearn, Ross-shire.

Ordinary Directors.

JOHN SPEIR, Newton Farm, Newton, Glasgow.
GEORGE DUN, Easter Kincapple, St Andrews.
SIR J. R. G. MAITLAND of Barnton, Bart., Craigend, Stirling.
JAMES I. DAVIDSON, Saughton Mains, Gorgie, Edinburgh.
W. H. LUMSDEN of Balmedie, Aberdeenshire.
ROBERT F. DUDGEON of Cargen, The Grange, Kirkcudbright.
JOHN MACPHERSON GRANT, Milton Cottage, Kingussie.
JOHN SCOTT DUDGEON, Longnewton, St Boswells.
ALEXANDER CROSS of Knockdon, 19 Hope Street, Glasgow.
CAPTAIN CLAYHILLS HENDERSON of Invergowrie, R.N., Dundee.
W. T. MALCOLM, Dunmore Home Farm, Larbert.
CAPTAIN ROBERT DUNDAS, yr. of Arniston, Kirkhill, Gorebridge.
WILLIAM DUTHIE, Tarves, Aberdeenshire.
JAMES LOCKHART, Mains of Airies, Stranraer.
C. M. CAMERON, Balnakyle, Munlochy.
THE HON. THE MASTER OF POLWARTH, Humble House, Upper Keith.
DAVID M'GIBBON, Ardnacraig, Campbeltown.
ANDREW HUTCHESON, Beechwood, Perth.
JOHN M. MARTIN of Auchendennan, Alexandria, N.B.
JAMES HOPE, East Barns, Dunbar.
ALEXANDER M. GORDON of Newton, Inch, Aberdeenshire.
WELLWOOD MAXWELL of Kirkennan, Dalbeattie.
J. D. FLETCHER of Rosehaugh, Inverness.
JOHN WILSON, Chapelhill, Cockburnspath.
CHARLES HOWATSON of Glenbuck, Glenbuck.
SIR RALPH ANSTRUTHER of Balcaskie, Bart., Pittenweem.
ROBERT PATERSON, Hill of Drip, Stirling.
SIR JAMES H. GIBSON-CRAIG of Riccarton, Bart., Currie.
JOHN MARR, Cairnbrogie, Old Meldrum.
REV. JOHN GILLESPIE, Mouswald Manse, Ruthwell, R.S.O.
JOHN CRAN, Kirkton, Bunchrew, Inverness.
C. H. SCOTT PLUMMER of Sunderland Hall, Selkirk.

Extraordinary Directors.

JOHN A. DEWAR, Lord Provost of Perth.
 Lord KINNAIRD, Rossie Priory, Inchture.
 Sir ROBERT D. MONCREIFFE of Moncreiffe, Bart., Bridge of Earn.
 Sir ALEX. MUIR MACKENZIE of Delyne, Bart., Dunkeld.
 Sir C. E. ADAM of Blairadam, Bart., Kinross-shire.
 W. STEUART FOTHERINGHAM, Murthly Castle, Murthly, Perthshire.
 ALEXANDER MACDUFF of Bonhard, Perth.
 JOHN BALLINGALL, Dunbog, Newburgh, Fife.
 DAVID BUTTAR, Corston, Coupar-Angus.
 ANDREW RALSTON, Glamis, Forfarshire.
 DAVID WILSON, yr. of Carbeth, Killearn.
 JOHN GILMOUR of Montrave, Leven, Fife.
 LORD REAY, Carolside, Earlston.
 WALTER ELLIOT, Hollybush, Galashiels.
 W. S. FERGUSON, Pictstonhill, Perth.
 GEORGE R. GLENDINNING, Hatton Mains, Kirknewton.
 W. J. MAXWELL, yr. of Munches, Terraughtie, Dumfries.
 R. SINCLAIR SCOTT, Burnside, Largs.
 GEORGE J. WALKER, Portlethen, Aberdeen.
 R. SHIRRA GIBB, Boon, Lauder.

Office-Bearers.

Sir G. GRAHAM MONTGOMERY of Stanhope, Bart., *Honorary Secretary*.
 JAMES MACDONALD, F.R.S.E., *Secretary*.
 Rev. ARCHIBALD SCOTT, D.D., *Chaplain*.
 ANDREW P. AITKEN, D.Sc., 8 Clyde Street, *Chemist*.
 WILLIAM HOME COOK, C.A., *Auditor*.
 TODD, MURRAY, & JAMIESON, W.S., *Law Agents*.
 A. N. M'ALPINE, 60 John Street, Glasgow, *Consulting Botanist*.
 JAMES D. PARK, *Practical Engineer*.
 JOHN MACDIARMID, *Clerk*.
 EDWARD M. COWIE, *Second Clerk*.
 WILLIAM WILLIAMS, F.R.C.V.S., *Professor of Veterinary Surgery*.
 WILLIAM BLACKWOOD & SONS, *Printers and Publishers*.
 KEITH & Co., 65 George Street, *Advertising Agents*.
 G. WATERSTON & SONS, *Stationers*.
 THOMAS SMITH & SONS, 47 George Street, *Silversmiths*.
 ALEXANDER KIRKWOOD & SON, 9 St James' Square, *Medallists*.
 JOHN WATHERSTON & SONS, *Inspectors of Works*.
 WILLIAM SIMPSON, *Messenger*.

Chairman of Board of Directors.

Rev. JOHN GILLESPIE.

Chairmen of Committees.

- | | |
|---------------------------------------|--------------------------------------|
| 1. <i>Argyll Naval Fund,</i> | Captain G. D. CLAYHILLS HENDERSON. |
| 2. <i>Finance, Chambers, and Law,</i> | JAMES AULDJO JAMIESON, W.S. |
| 3. <i>Publications,</i> | Rev. JOHN GILLESPIE, Mouswald Manse. |
| 4. <i>Shows,</i> | Sir JAMES H. GIBSON-CRAIG, Bart. |
| 5. <i>Science,</i> | DAVID WILSON, yr. of Carbeth. |
| 6. <i>General Purposes,</i> | Sir JAMES H. GIBSON-CRAIG, Bart. |

General Meetings.—By the Charter the Society must hold two General Meetings each year, and, under ordinary circumstances, they are held on the third Wednesday of the months of January and June, at one o'clock, in the Society's Hall, 3 George IV. Bridge, for the election of Members and other business. Twenty a quorum.

By a resolution of the General Meeting on 15th January 1879, a General Meeting of Members is held in the Showyard on the occasion of the Annual Show. This year it will be held at Perth, on Wednesday, 22d July, at an hour to be announced in the programme of the Show.

With reference to motions at General Meetings, Bye-Law No. 10 provides—"That at General Meetings of the Society no motion or proposal (except of mere form or courtesy) shall be submitted or entertained for immediate decision unless notice thereof has been given a week previously to the Board of Directors, without prejudice, however, to the competency of making such motion or proposal to the effect of its being remitted to the Directors for consideration, and thereafter being disposed of at a future General Meeting."

General Show at Perth—21st, 22d, 23d, and 24th July.—Entries close for Implements, 18th May—Stock, Poultry, and Dairy Produce, 15th June.

Directors' Meetings.—The Board of Directors meet on the first Wednesday of each month from November till June inclusive, at half-past one o'clock p.m., and occasionally as business may require, on a requisition by three Directors to the Secretary, or on intimation by him. Seven a quorum.

Nomination of Directors.—Meetings of Members, for the purpose of nominating Directors to represent the Show Districts on the Board, will be held at the places and on the days after mentioned :—

- | | |
|--|--------------------------------|
| 1. Glasgow, North British Station Hotel, | Wednesday, 26th Feb., at 1. |
| 2. Stirling, Golden Lion Hotel, . . . | Friday, 28th Feb., at 1.30. |
| 3. Perth, Salutation Hotel, . . . | Friday, 6th March, at 2. |
| 4. Edinburgh, 3 George IV. Bridge, | Wednesday, 11th March, at 2. |
| 5. Kelso, Cross Keys Hotel, . . . | Friday, 13th March, at 12.30. |
| 6. Dumfries, King's Arms Hotel, . . . | Wednesday, 18th March, at 1. |
| 7. Aberdeen, Imperial Hotel, . . . | Friday, 20th March, at 12. |
| 8. Inverness, Caledonian Hotel, . . . | Tuesday, 24th March, at 12.30. |

The nomination of Proprietors or other Members paying the higher subscription must be made in the 2d, 6th, 7th, and 8th Districts ; and the nomination of Tenant-Farmers or other Members paying the lower subscription, in the 1st, 3d, 4th, and 5th Districts.

Committee Meetings.—Meetings of the various Committees are held as required.

Examinations for the Society's Diploma and Certificate in Agriculture and Certificates in Forestry are fixed to be held as follows : Forestry written, 7th April ; Agricultural written, 8th and 9th April ; Oral, both subjects, 10th April.

COMMITTEES FOR 1896.

1. ARGYLL NAVAL FUND.

Capt. G. D. CLAYHILLS HENDERSON of Invergowrie, R.N., Dundee, *Convener*.
 Sir DAVID BAIRD of Newbyth, Bart., Prestonkirk.
 Sir ROBERT MENZIES of Menzies, Bart., Farleyer, Aberfeldy.
 DAVID M'GIBBON, Ardnacraig, Campbeltown.
 JOHN MACLACHLAN of MacLachlan, 48 Castle Street, Edinburgh.

2. FINANCE, CHAMBERS, AND LAW.

JAMES AULDJO JAMIESON, W.S., 66 Queen Street, Edinburgh, *Convener*.
 Sir JAMES H. GIBSON-CRAIG of Riccarton, Bart., *Vice-Convener*.
 Rev. JOHN GILLESPIE, Mouswald Manse, Ruthwell, R.S.O.
 G. R. GLENDINNING, Hutton Mains, Kirknewton.
 JOHN SCOTT DUDGEON, Longnewton, St Boswells.
 ALEXANDER CROSS of Knockdon, 19 Hope Street, Glasgow.
 A. M. GORDON of Newton, Inch, Aberdeenshire.
 Captain ROBERT DUNDAS, yr. of Arniston, Kirkhill, Gorebridge.
 Sir G. GRAHAM MONTGOMERY of Stanhope, Bart., Stobo Castle, *ex officio*.
 WILLIAM HOME COOK, C.A., Auditor, *ex officio*.

3. PUBLICATIONS.

Rev. JOHN GILLESPIE, Mouswald Manse, Ruthwell, R.S.O., *Convener*.
 Dr A. P. AITKEN, 8 Clyde Street, Edinburgh.
 R. G. WARDLAW RAMSAY, Tillicoultry House, Tillicoultry.
 JOHN SCOTT DUDGEON, Longnewton, St Boswells.
 JOHN SPEIR, Newton Farm, Newton, Glasgow.
 DAVID WILSON, yr. of Carbeth, Killearn.

4. SHOWS.

Sir JAMES H. GIBSON-CRAIG of Riccarton, Bart., Currie, *Convener*.
 JOHN M. MARTIN of Auchendennan, Alexandria, N.B., *Vice-Convener*.
 Sir ROBERT MENZIES of Menzies, Bart., Farleyer, Aberfeldy.
 JOHN CRAN, Kirkton, Bunchrew, Inverness.
 WALTER ELLIOT, Hollybush, Galashiels.
 Rev. JOHN GILLESPIE, Mouswald Manse, Ruthwell, R.S.O.
 JOHN GILMOUR of Montrave, Leven.
 W. H. LUMSDEN of Balmedie, Aberdeen.
 JOHN MARR, Cairnbrogie, Old Meldrum.
 JAMES LOCKHART, Mains of Airies, Stranraer.
 JONATHAN MIDDLETON, Clay of Allan, Fearn.
 R. SINCLAIR SCOTT, Burnside, Largs.
 W. S. FERGUSON, Pictstonhill, Perth.
 GEORGE DUN, Easter Kincaid, St Andrews.
 ALEX. M. GORDON of Newton, Inch, Aberdeenshire.
 ALEX. CROSS of Knockdon, 19 Hope Street, Glasgow.
 ANDREW HUTCHESON, Beechwood, Perth.
 W. T. MALCOLM. Dunmore Home Farm, Laibert.

G. R. GLENDINNING, Hatton Mains, Kirknewton.
 J. D. FLETCHER of Rosehaugh, Inverness.
 JAMES HOPE, East Barns, Dunbar.
 C. M. CAMERON, Balnakyle, Munlochy.
 CHARLES HOWATSON of Glenbuck, Glenbuck.
 C. H. SCOTT PLUMMER of Sunderland Hall, Selkirk.
 JOHN WILSON, Chapelhill, Cockburnspath.
 Sir RALPH ANSTRUTHER of Balcaskie, Bart., Pittenweem.
 WILLIAM DUTHIE, Tarves, Aberdeenshire.
 ROBERT F. DUDGEON of Cargen, The Grange, Kirkcudbright.
 JAMES D. PARK, Engineer, *ex officio*.

5. SCIENCE.

DAVID WILSON, yr. of Carbeth, Killearn, *Convener*.
 JONATHAN MIDDLETON, Clay of Allan, Fearn, Ross-shire, *Vice-Convener*.
 G. R. GLENDINNING, Hatton Mains, Kirknewton.
 R. SHIRRA GIBB, Boon, Lauder.
 The Hon. The MASTER OF POLWARTH, Humble House, Upper Keith.
 W. S. FERGUSON, Pictstonhill, Perth.
 GEORGE HENDERSON, Upper Keith.
 JOHN SPEIR, Newton Farm, Newton, Glasgow.
 JOHN SCOTT DUDGEON, Longnewton, St Boswells.
 ANDREW HUTCHESON, Beechwood, Perth.
 ALEX. CROSS of Knockdon, 19 Hope Street, Glasgow.
 Rev. JOHN GILLESPIE, Mouswald Manse, Ruthwell, R.S.O.
 Sir ROBERT MENZIES of Menzies, Bart., Farleyer, Aberfeldy.
 JOHN WILSON, Chapelhill, Cockburnspath.
 Captain ROBERT DUNDAS, yr. of Arniston, Kirkhill, Gorebridge.
 LORD REAY, Carolside, Earliston.
 JOHN GILMOUR of Montrave, Leven, Fife.
 JAMES HOPE, East Barns, Dunbar.
 Dr AITKEN, Chemist, *ex officio*.
 A. N. M'ALPINE, Botanist, *ex officio*.
 Professor WILLIAMS, *ex officio*.
 Rev. JOHN GILLESPIE, Mouswald Manse, Ruthwell, R.S.O.

6. GENERAL PURPOSES.

Sir JAMES H. GIBSON-CRAIG of Riccarton, Bart., Cuirie, *Convener*.
 The Hon. The MASTER OF POLWARTH, Humble House, Upper Keith.
 G. R. GLENDINNING, Hatton Mains, Kirknewton.
 ALEX. M. GORDON of Newton, Inch, Aberdeenshire.
 Rev. JOHN GILLESPIE, Mouswald Manse, Ruthwell, R.S.O.
 JAMES HOPE, East Barns, Dunbar.
 JOHN M. MARTIN of Auchendennan, Alexandria, N.B.

The President, Vice-Presidents, the Treasurer, Honorary Secretary, and Chairman of Directors are members *ex officio* of all Committees.

AGRICULTURAL EDUCATION

CERTIFICATE AND DIPLOMA IN AGRICULTURE.

COUNCIL ON EDUCATION.

By a Supplementary Charter under the Great Seal, granted in 1856, the Society is empowered to grant Diplomas.

Members of Council named by Charter.

The PRESIDENT of the HIGHLAND AND AGRICULTURAL SOCIETY—*President.*

The LORD JUSTICE-GENERAL—*Vice-President.*

The LORD ADVOCATE.

The DEAN OF FACULTY.

The PROFESSOR OF AGRICULTURE.

The PROFESSOR OF ANATOMY.

The PROFESSOR OF BOTANY.

The PROFESSOR OF CHEMISTRY.

The PROFESSOR OF NATURAL HISTORY.

Members of Council nominated by Society.

The MASTER OF POLWARTH.

Sir JAMES H. GIBSON-CRAIG of Riccarton, Bart.

R. G. WARDLAW RAMSAY of Whitehill.

W. J. MAXWELL, yr. of Munches, Terraughtie, Dumfries.

Rev. JOHN GILLESPIE, Mouswald, Ruthwell, R.S.O.

JOHN MARR, Cairnbrogie, Old Meldrum.

ALEXANDER CROSS of Knockdon.

Standing Acting Committee.

The LORD JUSTICE-GENERAL—*Convener.*

The PROFESSOR OF AGRICULTURE.

The PROFESSOR OF BOTANY.

The PROFESSOR OF CHEMISTRY.

Rev. JOHN GILLESPIE of Mouswald.

R. G. WARDLAW RAMSAY of Whitehill.

Board of Examiners.

Science and Practice of Agriculture.—Professor WALLACE, University, Edinburgh; JAMES HOPE, East Barns, Dunbar; JAS. BIGGAR, yr. of Chapelton, Dalbeattie; and Professor WRIGHT, Glasgow and West of Scotland Technical College, 60 John Street, Glasgow.

Botany.—A. N. M'ALPINE, Technical College, 60 John Street, Glasgow, and R. S. M'DUGALL, Edinburgh.

Chemistry, Physics, and Agricultural Chemistry.—Dr A. P. AITKEN, Edinburgh, and Dr WILLIAM CRAIG, Edinburgh.

Natural History.—Professor COSSAR EWART, Edinburgh, and Dr RAMSAY H. TRAQUAIR, Edinburgh.

Veterinary Science.—Professor WILLIAMS, Edinburgh, and FINLAY DUN, F.R.C.V.S., Edinburgh.

Field-Engineering.—DAVID ALAN STEVENSON, C.E., Edinburgh, and A. W. BELFRAGE, C.E., Edinburgh.

Book-keeping.—WILLIAM HOME COOK, C.A., Edinburgh, and J. WILSON BRODIE, C.A., Edinburgh.

The maximum number of marks in each subject is 100. In Agriculture, 75 marks qualify for Diploma and 60 for Certificate; in other subjects, 60 for Diploma and 40 for Certificate.

If a Candidate fail for the Diploma in Agriculture, or in more than two of the other subjects, he must take the entire Examination again; if he has obtained Diploma marks in Agriculture and failed in not more than two of the other subjects, he may come up again for examination in these subjects alone.

BYE-LAWS.

I. That, in terms of the Charter, the Society shall nominate seven members to act on the Council on Education.

II. That the Council shall appoint a Board of Examiners on the following subjects:—Science and Practice of Agriculture; Botany; Chemistry; Natural History; Veterinary Science; Field-Engineering; and Book-keeping.

III. That the examinations shall be both written and oral, and that the value of the answers shall be determined by numbers.

IV. That there shall be two examinations,¹ to be styled respectively the "First-Class Certificate Examination" and the "Diploma Examination."

V. That to pass the "First-Class Certificate Examination," a candidate must be acquainted with the science and practice of agriculture, botany, chemistry, natural history, veterinary science, field-engineering, and book-keeping; and that a certificate in the following terms, bearing the corporate seal and arms of the Society, signed by the President or Vice-President of the Council on Education and by the Secretary, shall be granted to candidates passing this examination:—

"These are to certify that on the _____, A. B. was examined, and has been found to possess a knowledge of the science and practice of agriculture, botany, chemistry, natural history, veterinary science, field-engineering, and book-keeping."

VI. That to pass the "Diploma Examination," a candidate must possess a *thorough knowledge* of the science and practice of agriculture, botany, chemistry, natural history, veterinary science, field-engineering, and book-keeping; and that a diploma in the following terms, bearing the corporate seal and arms of the Society, and signed by the President or Vice-President of the Council on Education and by the Secretary, shall be granted to candidates passing this examination:—

"These are to certify that on the _____, A. B. was examined, and has been found to be proficient in the science and practice of agriculture, botany, chemistry, natural history, veterinary science, field-engineering, and book-keeping."

VII. That each successful candidate for the Society's Agricultural Diploma shall thereby become eligible to be elected a free life member of the Society.

VIII. That a Standing Acting Committee of the Council on Agricultural Education shall be appointed by the Directors.

Note.—The names of Diploma Free Life Members will be found in the list of Members of the Society.

The list of those who, up till 1893, had obtained the First-Class Certi-

¹ The examinations will be held in 1896 on the 7th, 8th, 9th, and 10th April.

ificate appears in vol. v., fifth series (1893), of the 'Transactions.' The following have since obtained

FIRST-CLASS CERTIFICATES.

| | | |
|-------|-------------------------|--------------------------------|
| 1893. | JOHN A. SIMPSON, | The Orchard, Banff. |
| 1893. | DAVID L. SMITH, | Aspatia. |
| 1893. | G. R. THOMAS, | do. |
| 1894. | DAVID BLAIR, | Bankfoot, Inverkip. |
| 1894. | B. R. S. PRICHARD, | Brislington, Bristol. |
| 1895. | ROBERT ALLAN, | Halfway House, Whitburn. |
| 1895. | JAMES BARRON, | Agricultural College, Aspatia. |
| 1895. | WM. COOK BRACKENRIDGE, | do. do. |
| 1895. | DAVID DICKINSON, | do. do. |
| 1895. | ROBERT HEWISON, | do. do. |
| 1895. | JOHN LUKER, | do. do. |
| 1895. | JOSEPH HENRY TOWNSEND, | do. do. |
| 1895. | DAVID DONALD, | Whitench. |
| 1895. | JAMES DUTHIE JOHNSTON, | Mossbank, Fettercairn. |
| 1895. | JAMES M'CREATH, | Auchenwinn, Maybole. |
| 1895. | F. J. WALKINGTON, | Greythorn, Kingstown. |
| 1895. | SYDNEY EDWARDS POUNNET, | Edinburgh. |

SYLLABUS OF EXAMINATION

FOR DIPLOMA AND CERTIFICATE.

I.—SCIENCE AND PRACTICE OF AGRICULTURE.

1. *Geology*.—Geological strata—surface geology—formation of soils—their classification—physical characters and composition—suitability for cultivation.

2. *Drainage, &c.*—The principles on which drainage, irrigation, and warping operations should be based and carried out.

3. *Top-dressing*.—The application of lime—marl—clay, &c.

4. *Rotations*.—The principle of rotations—rotations suitable for different soils—systems of farming.

5. *Manures*.—The composition of manures—general and special—amounts used per acre—period and mode of application.

6. *Food-stuffs*.—The composition of feeding substances—their suitability for different classes of farm stock—considerations affecting their use.

7. *Crops*.—"How crops grow"—our farm crops—their cultivation, including cleaning, harvesting, and storage—diseases—insect injuries and remedies. The formation and management of plantations.

8. *Ensilage*.—Sweet and sour silage—different forms of silos and systems of ensilage.

9. *Weather*.—Meteorology, or the laws of climate as affecting plant-life—the influence of light and heat on cultivation—of absorption and retention of heat and moisture—of porosity and capillarity in soils.

10. *Live Stock*.—The breeding, rearing, feeding, and general treatment of farm stock—the different breeds of horses, cattle, sheep, and pigs—their characteristics—the districts where they are generally met with.

11. *Machinery*.—The machines and implements used in farming—their uses, prices, and the principal points to be attended to in their construction.

12. *Mechanical Powers*.—The “prime movers,” or sources of power used in agriculture: man—horse—wind—water—steam—their relative values and advantages.

13. *Farming Capital*.—Calculations of the cost of stocking and working arable, stock, and dairy farms.

Text-books.—Stephens’ ‘Book of the Farm,’ William Blackwood & Sons, Edinburgh and London; Pringle’s ‘Live Stock of the Farm,’ William Blackwood & Sons; Wallace’s ‘Farm Live Stock of Great Britain,’ Crosby Lockwood & Son; Mc’Connell’s ‘Agricultural Facts and Figures,’ Crosby Lockwood & Son; ‘Our Farm Crops,’ Blackie & Son; ‘How Crops Grow,’ Macmillan & Co; Warrington’s ‘Chemistry of the Farm,’ Vinton & Co., Limited, London; M’Alpine’s ‘Grasses’; Geikie’s ‘Outlines of Geology.’

II.—BOTANY.

1. *Nutritive Organs of Plants*.—Root, stem, leaves. Functions of roots. Various kinds of stem, with examples. Use of the stem. Structure of leaves. Different kinds of leaves. Arrangement and functions of leaves.

2. *Reproductive Organs*.—Flower and its parts. Arrangements of the whorls of the flower—calyx, corolla, stamens, pistil. Ovule. Mature pistil or fruit. Pruning and grafting. Seed. Young plant or embryo. Sprouting of the seed, or germination.

3. *General Principles of Classification*.—Meaning of the terms Class, Order, Genus, and Species. Illustrations of natural orders taken from plants used in agriculture, such as grain crops, grasses, clovers, vetches, turnips, mangel-wurzel, peas, beans, &c. Practical examination in fresh specimens and models; some of the latter may be seen in the Museum at the Royal Botanic Garden, which is open daily to the public, free.

Text-book.—Balfour’s ‘Elements of Botany,’ A. & C. Black.

III.—CHEMISTRY AND PHYSICS.

Physics.

Matter.—Essential properties. Measurement of mass and capacity—decimal system. Solids, general properties. Liquids—capillarity, osmosis, hydrostatic law. Gases—density, diffusion, barometer, Boyle’s law, Charles’s law.

Energy.

Transformation and Conservation of energy. Heat—temperature, thermometer, conduction, convection, radiation, mechanical equivalent of heat. Light—refraction, polarisation, the spectrum.

Chemistry.

Processes—solution, filtration, sublimation, distillation, crystallisation, dialysis. Fundamental laws—constant proportion, multiple proportion, Avogadro’s law, periodic law. Classification of the elements—characteristics of the commoner elements. Water—natural waters, their common impurities, soft and hard waters, water storage, water purification, composition, analysis, hydrates, steam, latent heat of water and steam. Hydrogen. Oxygen, oxides. Acids, bases, salts. Nitrogen, ammonia, nitric acid, nitrates and nitrites. The atmosphere—relation to animal and vegetable life. Chlorine—hydrochloric acid, chlorides, hypochlorites, bleaching-powder, bleaching, disinfection, chlorates. Bromine, iodine, and fluorine, and their chief compounds. Sulphur, sulphuretted hydrogen, sulphuric acid and sulphates, sulphurous acid, sulphites, and thiosulphates. Phosphorus, oxides of phosphorus, phosphates. Borates and silicates. Carbon, its oxides, carbonates, carbon

disulphide. Hydrocarbons, chloroform, alcohols, ether, aldehyde, amines and amides, formic, acetic, oxalic, lactic, tartaric, and citric acids and their commonest salts. Glycerol, saponification. Distillation of wood and coal. Benzene, anilin, carbolic acid, benzoic acid, turpentine. Hydrocyanic acid, cyanides, cyanates. Urea, uric and hippuric acids.

The following metals, their ores, metallurgy, oxides, and more important salts—potassium, sodium, barium, calcium, magnesium, aluminium, zinc, manganese, iron, chromium, bismuth, antimony, arsenic, lead, copper, mercury, silver, tin, platinum.

The chief tests for these metals and for the following acids—sulphuric, sulphurous, phosphoric, carbonic, hydrochloric, nitric, acetic, and oxalic. Alkaloids, morphin, quinin, strychnin.

IV.—AGRICULTURAL CHEMISTRY.

1. *Soils*.—Their origin, formation, and classification. The physical and chemical properties of soils, and their improvement by physical and chemical means—their relation to air and water. Nitrification and the biology of the soil.

2. *Plants*.—The mineral and organic constituents of plants. The substances required for plant nutrition, and their relative importance. The chemical processes occurring in the germination, growth, and maturation of plants. Albuminoids, amides, and amido acids. Carbohydrates—sugars, starch, cellulose, pentoses. Fermentations—alcoholic, acetic, lactic, and butyric. Plant decay.

3. *Manures*.—Farmyard manure—its composition, improvement, and conservation. Fertilisers—their classification, composition, uses, and abuses—their mutual compatibility—their suitability for different crops and for different soils. The investigation and analysis of fertilisers, and their valuation and economic application. The conducting of manurial experiments.

4. *Crops*.—The chemical composition of the more important crops, and their mutual relations. The science of rotations. Symbiosis.

5. *Fodders*.—The general composition of the different classes of fodder crops. The circumstances affecting the nutritive value and digestibility of fodders. The injuries and impurities to which they are liable. The analysis and investigation of fodders. The detection of impurities in concentrated fodders.

6. *Animal Nutrition*.—The main facts regarding respiration and digestion. The production of flesh, fat, and bone. The nutrient ratio as a guide in stock-feeding. The calculation of dietaries. The relation of food to the age, condition, and progress of stock, and also to work. The conducting of feeding experiments.

7. *Dairy Produce*.—The chemical composition of milk. The testing and analysis of milk. The circumstances affecting milk production. Milk preservation. The composition of butter and cheese, and the chemical and physical conditions requisite for the production of butter and cheese of good quality. The sophistications of dairy produce and their detection. The diseases of milk and cheese, and the means of preventing their occurrence. The general scientific conduct of the dairy.

8. *The Relation of Food to Manure*.—The quality of manure derived from different kinds of stock, according to age, use, and feeding. Circumstances affecting the value of manures derived from feeding. The estimation of unexhausted fertility under different systems of feeding, manuring, and cropping.

Text-books.—Roscoe's 'Lessons in Elementary Chemistry,' Macmillan & Co., London, price 4s. 6d.; Johnston and Cameron's 'Elements of Agri-

cultural Chemistry and Geology,' William Blackwood & Sons; Johnston's 'How Crops Grow,' Macmillan & Co., London; Warrington's 'Chemistry of the Farm,' Vinton & Co., Limited, London.

V.—NATURAL HISTORY.

1. ZOOLOGY.

1. The characters distinguishing the primary divisions of the Animal Kingdom.

2. A general knowledge of British Mammals, Birds, and Fresh-water Fishes. A more special knowledge of the natural history of the domestic animals and their parasites.

3. The classification of insects, and a knowledge of those which are injurious to crops.

Text-book.—Nicholson's 'Introductory Text-Book of Zoology,' William Blackwood & Sons, Edinburgh and London.

2. GEOLOGY.

1. A general knowledge of the chemical composition and physical characters of the rock-forming minerals, and of the composition and mode of occurrence of the common rocks. The changes in rocks and minerals induced by weathering.

2. The terms (Dip, Strike, &c.) used in descriptive field Geology.

3. A general knowledge of the great geological formations, with their characteristic fossils.

4. The geological sources of the leading economic mineral products.

5. Influence of the geological structure of a country on the configuration of the land and the composition of the soil.

Text-books.—Page's 'Introductory Text-Book of Geology' and Lyell's 'Students' Elements of Geology.'

VI.—VETERINARY SCIENCE.

1. Anatomy of the digestive organs of horse, ox, and sheep, including their structural differences.

2. The digestive processes and principles of nutrition in the above animals.

3. A general knowledge of the blood and its circulation, and the processes of respiration, secretion, and excretion.

4. The physiology of reproduction, and its bearings on healthy breeding.

5. The period of utero-gestation in the mare, cow, ewe, and sow, and the special management of these animals prior to, at the time of, and after parturition.

6. The feeding and general management of farm stock.

7. Their more common diseases, with the general principles of treatment.

Text-books.—'Youatt on Sheep,' price 7s. 6d.; Steel's 'Diseases of the Ox,' price 15s.; Williams's 'Principles and Practice of Veterinary Surgery,' price 30s.; Williams's 'Principles and Practice of Veterinary Medicine,' price 30s.

VII.—FIELD-ENGINEERING.

1. Land-surveying with the chain.

2. Mensuration of areas of land, in imperial and Scotch acres, from a chain survey or from a plan.

3. Levelling with the ordinary levelling instrument and staff, and calculating levels and gradients.

Text-book.—‘Rudimentary Treatise on Land and Engineering Surveying,’ by T. Baker, C.E., Weale’s Series, price 2s. Part i. chaps. 1, 2, 3, and 6, and part ii. chap. 1, to be read.

VIII.—BOOK-KEEPING.

1. Questions in Practice and Proportion.

2. Book-keeping—Describe books to be kept; give examples—taking of stock.

Text-book.—Stephens’ ‘Practical System of Farm Book-keeping,’ William Blackwood & Sons, Edinburgh, price 2s. 6d.

EXAMINATION PAPERS, 1896.

AGRICULTURE.

1. Given an arable farm of 300 acres—100 acres of which are in permanent pasture and hay meadows—suitable for dairying and for the fattening of cattle at all seasons of the year. Fifty cows are kept, and a good system of winter dairying is adopted, so that a good supply of milk is available all the year round. (a) Mention the number and character of the additional stock required to consume the bulky produce of the holding, and state what profit you would expect from the same; (b) state the area of land required to provide the necessary home-grown supply of food for the 50 cows all the year round, and mention the most suitable foods and amounts of the same to grow at the different seasons; (c) make up a good ration for a cow in full milk in winter time. (It is necessary to state (1) the live-weight of the cow, (2) the total amount of dry food present in the mixture, and (3) the albuminoid ratio of the food.)

2. Describe the process of the cross-fertilisation of the common grain-crops. What results have been obtained in this connection by the Messrs Garton of Newton-le-Willows, or other workers in a similar field? What advantages are likely to be derived by Agriculture from such work?

3. Enumerate the motive-powers of the farm, and state for what purposes each is best adapted. Compare the cost and efficiency of manual and of horse power.

4. What points would you expect to find in a good feeding animal? Give a suitable daily ration for a fattening bullock of 1000 lb. live-weight, estimate the weekly cost, and state how much gain in live-weight should be obtained.

5. Give details of the management of a flock of breeding ewes on a mixed arable-grazing farm. Also of the management of a lot of lambs from August till fit for the butcher.

6. I bought a lot of 40 bullocks in the end of September, weighing 10 cwt. each, at £14 apiece. I fed them for an average of 14 weeks, during which they consumed 40 tons yellow turnips, 80 tons swedes, 10 tons linseed-cake at £6 per ton, 3 tons maize-meal at £4, 10s. per ton, and 200 bushels oats. Also 12 tons hay worth £4 a ton, and had straw as required for litter. I sold them in Edinburgh. They averaged 11 cwt. each live-

weight, and made 32s. per cwt., less 10s per head expenses. Make out a *Dr.* and *Cr.* account of the transactions, and state any conclusions you have come to.

7. Take an arable farm of 400 acres in good condition, detail the quantities of the different crops you would have if the farm was worked on a four-course shift, and also give the same if worked on a five-course shift; and further, say what advantages or disadvantages the one course has over the other.

8. On the same farm state the quantities of grain, wheat, oats, and barley you would expect to grow per acre, also the number of stones per acre of each kind of straw, and how much manure would each ton of straw produce.

(Three hours allowed.)

BOTANY.

1. Name the parts of a grass leaf, and explain, if you can, the function of each part you name.

2. Describe the flower of a grass, and give the botanical names of the various parts.

3. Give an account of the natural order Cluciferae. Name three useful and three useless plants belonging to the order.

4. Describe and exemplify the following: rhizome, corm, tuber, bulb.

5. Describe the specimen.

(An hour and a half allowed.)

CHEMISTRY.

1. What is the action of chlorine on each of the following substances?—(1) marsh-gas; (2) alcohol; (3) ferrocyanide of potassium; (4) caustic potash.

2. How can pure silver be made from a sixpence?

3. How is sulphuretted hydrogen prepared? What occurs when a stream of sulphuretted hydrogen gas is passed into aqueous solutions of each of the following substances?—ammonia, silver nitrate, ferric sulphate.

4. How is acetic acid made? What is its formula? What percentage of carbon does it contain?

AGRICULTURAL CHEMISTRY.

1. What are the most important constituents of farmyard manure? What are their relative proportions? How would the addition of gypsum to the dung-heap affect each of them?

2. When superphosphate is put into the soil the soluble phosphate becomes insoluble; what are the substances in the soil which cause that? Explain the processes by means of equations.

3. How would you detect the presence of locust-bean meal and rice meal in a sample of linseed-cake?

4. I am offered nitrate of soda 95 per cent purity, and sulphate of ammonia 80 per cent purity, at £8 per ton each; which is the cheaper source of nitrogen? What is the difference?

(*Two hours allowed.*)

NATURAL HISTORY.

GEOLOGY.

1. Give the general characters and chemical composition of the following minerals—*quartz, pyrite, fluor, barite, orthoclase, albite*.

2. Explain the geological terms—*neck, dyke, vein, seam*.

3. In what geological formations does workable coal occur in Great Britain, and how would you in a general way distinguish these palæontologically?

4. Briefly describe a Belemnite; state to what group of animals these fossils belonged, and in what formations they occur.

ZOOLOGY.

1. What are the general characters of the order Carnivora? and enumerate the indigenous carnivora of Great Britain.

2. Contrast the skeleton of the fore-limb in the bat, dog, pig, ox, and horse.

3. Give an account of the life-history of the liver-fluke.

4. Briefly describe the Turnip-fly, refer it to its order, and give an account of its life-history.

(*An hour and a half allowed.*)

VETERINARY SURGERY.

1. What classes of horses are liable to grease? Describe the appearance of a confirmed case.

2. Describe the common situations of (a) a splint, (b) bone spavin, (c) ring-bone, and (d) curb.

3. What descriptions of food are apt to cause hoven in cattle? Detail the several ways in which such a condition is treated.

4. Detail the conditions which prevent a wound healing by "first intention."

(*In hour and a half allowed.*)

MENSURATION AND FIELD-ENGINEERING.

NOTE.—Candidates must work out the questions on sheets of paper which will be supplied to them, which sheets must bear the candidate's number, and be lodged, along with this examination paper, with the Secretary.

NOTE OF IMPERIAL MEASURE.

| | | | | |
|---------------------|---|-----------------|---|-------------------------|
| 10,000 square links | = | 1 square chain. | | |
| 625 do. | = | 0.0625 do. | = | 1 pole. |
| 25,000 do. | = | 2.5 do. | = | 40 poles=1 rood. |
| 100,000 do. | = | 10 do. | = | 160 do.=4 roods=1 acre. |

The imperial is to the Scotch acre as 1 : 1.261 nearly.

1. Find the area of the semicircular piece of ground A, whose diameter is 1000 links, and give the answer in acres, roods, and poles; and also in acres and decimals.

2. In measuring the base of the triangle A B C, the place of the perpendicular P was found to be 520 links from the point A, and the whole base 965 links; (i.) find the area of the triangle A B C in acres and decimals, and (ii) give the length of the side B C to one place of decimals.

3. Measure by the scale, and mark in links on the paper the measurements necessary to calculate the area of the figure A B C D E.

4. The contents of a piece of land being 691 Scotch acres, required the area in imperial acres and decimals.

5. Give the lengths in links and one place of decimals, of the sides of a rectangular piece of ground the area of which is 4 acres, and the breadth of which is to the length as 5 is to 7.

6. If a rectangular piece of ground measures 5 acres, 3 roods, 10 poles, and the length is 1120 links, what is the breadth in links and decimals?

7. Write down, as if in a level-book, the staff-readings in feet and decimals shown in the above sketch section; then reduce the levels beginning at A, so as to calculate the heights of B, C, D, E, and F above Datum—all in feet and decimals.

8. Calculate the gradient between points E and F in the preceding figure.

(An hour and a half allowed.)

ARITHMETIC AND BOOK-KEEPING.

1. Find by practice the value of 25 tons 11 cwt. 2 qrs. 12 lb. at £4, 8s. 4d. per cwt.

2. Find the value of 256 acres, 2 roods, 10 poles, at £1, 12s. 4½d. per acre.

3. Having bought a quantity of tea, I find that I lose 7 per cent by selling it at 3s. a pound. What ought I to sell it at to gain 10 per cent?

4. A farmer's male labourers are paid 1s. 4d. per day, and he has 21 female labourers at 11d. per day; the amount of the wages average 14½d. for each per day. How many men has he?

5. How much land, which lets at one guinea per acre, should be given for 350 acres, 2 roods, which lets at 22s. 6d. per acre?

6. A certain number of men, twice as many women, and three times as many boys earned in 5 days £7, 15s.; each man earned 1s. 6d., each woman 10d., and each boy 8d. a day. How many were there of each?

7. A rectangular plot of ground, 26 ft. broad, contains 92 sq. yds. 4 sq. ft. Find its length.

8. If 5 men can reap a rectangular field whose length is 800 feet and breadth 700 feet in $3\frac{1}{2}$ days of 14 hours each, in how many days of 12 hours each can 7 men reap a field whose length is 1800 feet and breadth 960 feet?

9. Name the different business books which ought to be kept by a farmer, and give effect to the following entries taken from the farmer's memorandum book:—

1895.

- Jan.* 1. Received price of 6 fat cattle (sold last market day by Brown) at £13, 10s. each, less commission and charges £4, 10s. 6d.
 " " Paid the amount realised from above into bank.
 " 2. J. Brown paid me to day £62, 10s., which I paid into bank.
 " 3. Drew from bank and paid half-yearly servants £70.
 " 4. Paid household expenses £10.
 " 5. Bought £50 worth of oilcake, and handed Brown, Jones, & Co. a cheque therefor.
 " 21. Bought from J. McLeod 10 stirks at £7 each, and granted him a bill at 3 months' date.
 " 23. Sold to J. Anderson hay valued at £60.
 " 25. Received letter from J. Anderson asking for and receiving permission to transfer the hay which was sold to him on the 23d instant to William Arrol, who is to pay for the hay in due course.
 " 26. Discounted J. Brown's acceptance for £100, and received in cash £99, and allowed for discount £1.
 " 31. James' acceptance for £10, due this date, has been returned dishonoured.

Describe how the books named ought to be brought to a close, and who the profit and loss in any one year's working would be arrived at.

N.B.—Candidates may not find it possible to undertake all the Arithmetic questions in the prescribed time, in which event they will please confine their attention to only as many of them as they can satisfactorily accomplish.

Half the allotted time should be devoted to Arithmetic and half to Book-keeping.

(An hour and a half allowed.)

VETERINARY DEPARTMENT.

The Society established a Veterinary Department in 1823, but by an arrangement made with the Royal College of Veterinary Surgeons, the Society's examination ceased in 1881. Holders of the Society's Veterinary Certificate are entitled to become Members of the Royal College of Veterinary Surgeons on payment of certain fees, without being required to undergo any further examination. The number of Students who have passed for the Society's Certificate is 1183.

In 1874, the Society resolved to vote annually eight silver medals for Class Competition to each of the two Veterinary Colleges in Edinburgh, and to the one in Glasgow.

FORESTRY DEPARTMENT

The Society grants FIRST and SECOND CLASS CERTIFICATES in FORESTRY.

BOARD OF EXAMINERS.

Science of Forestry, Practical Management of Woods, and Forest Entomology.—COLONEL BAILEY, Lecturer on Forestry, Edinburgh University, 7 Drummond Place; Dr SOMERVILLE, Durham College of Science, Newcastle-on-Tyne; J. GRANT THOMSON, Grantown, Strathspey; D. F. MACKENZIE, Morton Hall, Liberton, Mid-Lothian; ANDREW SLATER, Haystoun, Peebles.

Forest Botany and Zoology.—Professor BAYLEY BALFOUR, Professor A. N. M'ALPINE, and R. S. M'DOUGALL.

Physics, Chemistry, and Meteorology.—Dr WM. CRAIG and Dr A. P. AITKEN.

Land and Timber Measuring and Surveying; Mechanics and Construction, as applied to Fencing, Drainage, Bridging, and Road-making.—A. W. BELFRAGE, C.E., Edinburgh.

Book-keeping and Accounts.—WM. HOME COOK, C.A., Edinburgh.

Candidates must possess—1. A thorough acquaintance with the theory and practice of Forestry. 2. A general knowledge of the following branches of study, so far as these apply to Forestry: The Elements of Botany; The Elements of Physics, Chemistry, and Meteorology; Forest Entomology; Land and Timber Measuring and Surveying; Mechanics and Construction, as applied to fencing, draining, bridging, and road-making; Implements of Forestry; Book-keeping and Accounts.

The examinations are open to candidates of any age, will be both written and oral, and will include such practical tests as may from time to time be found convenient to apply.

The maximum number of marks for each subject is 100; First-Class marks in all subjects 75, Second-Class marks in all subjects 50, Pass marks in all subjects 40.

To obtain the *First-Class Certificate* a Candidate must have First-Class marks in Forestry and any three of the other subjects, and Pass in the

two remaining subjects. To obtain the *Second-Class Certificate* a Candidate must obtain Second-Class marks in Forestry and in any three of the other subjects, and Pass in the two remaining subjects.

If a Candidate fail to get First-Class marks in only one or two subjects he can, for the *First-Class Certificate*, come up again for examination in these subjects alone ; otherwise he must go through the entire examination again.

The following have obtained First-Class Certificates:—

| | |
|--|------|
| GEORGE YOUNG WALL, M.R.A.C., Durham, . . . | 1870 |
| WILLIAM BAILLIE, The Nurseries, Haddington, . . . | 1871 |
| WILLIAM ROBERTSON, Forester's House, Lauder, . . . | 1871 |
| PETER LONEY, Marchmont, Duns, . . . | 1873 |
| JOHN M. AITKEN, Norwood, Lockerbie, . . . | 1880 |
| RICHARD HENDERSON, Portland Estates Office, Kilmarnock, . . . | 1880 |
| A. H. GIBSON, Kirkcaldy, . . . | 1882 |
| ALEX. INGLIS, Greenlawdean, Greenlaw, . . . | 1882 |
| PETER REID, Port Ellen, Islay, . . . | 1884 |
| JOHN HARDIE WILSON, D.Sc, F.R.S.E., St Andrews, . . . | 1884 |
| CECIL HENRY HOOPER, M.R.A.C., Highlands Farm, Swanley, Kent, . . . | 1886 |
| WILLIAM SOMERVILLE, B.Sc., Prof. of Agriculture and Forestry, Durham College, Newcastle-on-Tyne, . . . | 1886 |
| JOHN BARDGETT, 1 Gayfield Street, Edinburgh, . . . | 1887 |
| WILFRED JAMES FLEET, Estate Office, Thurlow, Suffolk, . . . | 1888 |
| ARTHUR CHARLES FORBES, Bowood, Calne, Hants, . . . | 1888 |
| A. J. FARQUHARSON, Newtyle, Forfarshire, . . . | 1890 |
| JOHN C. MENZIES, Bankhead, Duns, . . . | 1891 |
| JOHN F. ANNAND, Bruckley, Aberdeenshire, . . . | 1895 |
| WILLIAM DAVIDSON, Aldbar, Brechin, . . . | 1895 |

The following have obtained Second-Class Certificates :—

| | |
|---|------|
| JOHN M'EWEN, Yellow Cottage, Killin, . . . | 1880 |
| THOMAS BEWICK, 56 North Street, St Andrews, . . . | 1885 |
| DONALD C. CAMERON GRANT, Southleigh, Murrayfield, . . . | 1886 |
| JOHN A. SAWYER, Horningsham, Warminster, Wilts, . . . | 1891 |
| H. W. TUCKER, Blackheath, . . . | 1893 |
| H. S. DAINE, Woolfall Hall Farm, Huyton, Liverpool, . . . | 1894 |
| JOHN MAUGHAN, Jervaulx Abbey, Bedale, . . . | 1894 |
| ERIC ARTHUR NOBBS, Edinburgh, . . . | 1894 |
| JOHN JAMES SIMPSON, The Gardens, Wortley, near Sheffield, . . . | 1894 |
| J. W. PATERSON, Brunstane Road, Portobello, . . . | 1895 |
| HUGH W. STONE, Carlton Lodge, Tunbridge Wells, . . . | 1895 |

SYLLABUS OF EXAMINATION.

I.—SCIENCE OF FORESTRY AND PRACTICAL MANAGEMENT OF WOODS.

I. *Principles of Scientific Forestry*.—1. Effects of heat, light, moisture, and air-currents on forest vegetation. 2. Effects of depth, porosity,

moisture, and chemical composition of the soil on forest vegetation. 3. Effects of forest vegetation on the soil and air. 4. Rate and extent of development, longevity, and reproductive power of trees. 5. Pure and mixed woods. 6. Systems of silviculture.

II. *Practical Management of Woods*.—7. Draining and irrigation. 8. Choice of species for various situations. 9. Seed and sowing, including nurseries. 10. Planting. 11. Natural regeneration by seed, shoots, and suckers. 12. Formation of mixed woods. 13. Tending of young woods. 14. Pruning. 15. Thinning. 16. Silvicultural characteristics of the principal trees.

III. *Injuries by Storms and Fires*.—17. Storms. 18. Fires.

IV. *Timber*.—19. Its technical properties. 20. Its defects. 21. Recognition of different kinds of timber. 22. Processes for increasing its durability.

V. *Utilisation of Produce*.—23. Uses of wood and other produce. 24. Felling. 25. Conversion. 26. Seasoning. 27. Transport. 28. Sales. 29. Harvesting of bark.

VI. *Forest Organisation*.—30. General ideas regarding a regulated system of forest management.

Books recommended.—Schlich's 'Manual of Forestry'; Nisbet's 'British Forest Trees'; Nisbet's 'Studies in Forestry'; Furst's 'Protection of Woodlands,' translated by Nisbet; Hough's 'Elements of Forestry'; Brown's 'Forester' (latest edition); Laslett's 'Timber and Timber Trees.'

II.—FOREST BOTANY.

The fundamental facts of morphology, physiology, and classification of plants. The structure and function of the plant-cell and the plant-tissues. Their primary distribution. The secondary changes they exhibit in consequence of perennation.

The structure and function of the root and shoot in flowering-plants. Buds, their forms and uses. The flower. The fruit. The seed.

The structure and function of vegetative and reproductive organs of fungi.

Relationship of plants to air, soil, and water. Effect of light, heat, and mechanical agencies upon plants. Nutrition. The nature and elements of the food of plants. Sources of plant-food. The absorption, elaboration, transference, and storage of food. Respiration and transpiration. Parasites and saprophytes. Symbiosis.

Growth of plants in length and thickness. Correlation of growth, pruning. Germination of seeds. Formation of wood and bark. Healing of wounds.

Diseases of plants due to faulty nutrition and unfavourable circumstances of growth. Diseases due to attacks of fungi.

Natural reproduction and propagation by seeds and by buds. Fertilisation of flowers. Hybridisation. Artificial propagation by budding, grafting, layering, and cutting.

The characters of the large groups and classes of the vegetable kingdom. The characters of the families of plants which include the chief timber trees. The botanical characteristics of the principal British forest-trees.

(including the structural features of their wood). The weeds of the forest and their significance.

Books recommended.—Scott, 'Structural Botany'; Prantl and Vines, 'Text-Book of Botany'; Marshall Ward, 'Timber and some of its Diseases'; Marshall Ward, 'Diseases of Plants'; Marshall Ward, 'The Oak'; Schlich's 'Manual of Forestry,' vol. ii., Appendix to chapter iv., by Marshall Ward; Hartig, 'Timbers, and how to know them,' translated by Somerville; Hartig, 'Anatomy and Physiology of Plants,' translated by Nisbet; Hartig, 'Diseases of Plants,' translated by Marshall Ward and Somerville; Warming, 'Handbook of Systematic Botany,' translated by Potter; Bower, 'Practical Botany for Beginners.'

III.—FOREST ZOOLOGY.

The group Insecta: its position in the animal kingdom. Structure, mode of reproduction, and metamorphosis of insects. The outlines of classification of the group. Conditions favourable to the numerical increase of insects. Natural checks to increase (*e.g.*, birds, mammals, parasitic insects). The identification and life-history of the more important insects injurious to forest-trees and fruit-trees. The damage caused by these insect pests and their mode of attack. The damage caused by animals. Preventive and remedial measures.

Books recommended.—Ormerod, 'Manual of Injurious Insects'; Fürst, 'Protection of Woodlands,' translated by Nisbet; various articles in 'Transactions' of Highland and Agricultural Society and of Royal Scottish Arboricultural Society.

IV.—PHYSICS, CHEMISTRY, AND METEOROLOGY.

Physics.

Mass, weight, specific gravity, solid, liquid, and gaseous states of matter. Capillarity, osmose, vapour tension, suction pump, force pump, syphon, barometer, atmospheric pressure. Boyles's law. Levers and pulleys. Heat, measurement of heat, specific heat; transference of heat by conduction, convection, and radiation. Boiling and freezing. Latent heat. The thermometer. The conservation and transformation of energy. Light—reflection, refraction, polarisation; the spectrum. The rudiments of electricity and magnetism.

Chemistry.

Elements. Oxygen, hydrogen, nitrogen;—their preparation, properties, and chief compounds. Acids, bases, salts. Combustion, oxidation, reduction. Sulphur, Carbon, Phosphorus; and their compounds, with oxygen and hydrogen. Metals—potassium, sodium, calcium, magnesium, aluminium, iron, copper, lead, mercury, and their chief compounds. Carbohydrates, marsh gas, olefiant gas, alcohol, acetic acid, oxalic acid. Distillation of wood and coal.

Meteorology.

The atmosphere, its composition and physical properties. Measurement of pressure and temperature. The barometer. Rain, hail, snow, fog, cloud, dew, the dew point, hoar frost. The weathering of rocks and soils. Gases injurious to vegetation.

Books recommended.—'Elementary Physics,' Balfour Stewart; 'Lessons in Elementary Chemistry,' Roscoe; 'Introductory Text-Book of Meteorology,' Buchan.

V.—LAND AND TIMBER MEASURING AND SURVEYING ;
MECHANICS AND CONSTRUCTION AS APPLIED TO FENCING,
BRIDGING, AND ROAD-MAKING.

1. The use of the level and measuring-chain. Measuring and mapping surface areas. 2. The measurement of solid bodies—as timber, stacked bark, fagots, &c., earthwork. 3. The different modes of fencing and enclosing plantations ; their relative advantages, durability, cost of construction, and repairs. 4. The setting out and formation of roads for temporary or permanent use. 5. The construction of bridges over streams and gullies ; of gates or other entrances.

Books recommended.—‘Agricultural Surveying,’ by John Scott (Weale’s Series) ; Hoppus’s ‘Tables’ ; ‘Farm Roads, Fences, and Gates,’ by John Scott (Weale’s Series) ; Brown’s ‘Forester’ (latest edition).

VI.—BOOK-KEEPING AND ACCOUNTS.

1. Questions in Practice, Proportion, and Decimal Fractions. 2. Book-keeping—describe books to be kept ; and best method of valuing timber. 3. Practical questions in Book-keeping will also be given.

Book recommended.—Brown’s ‘Forester’ (latest edition).

EXAMINATION PAPERS, 1896.

PRACTICAL FORESTRY.

1. What favourable effects on forest soil and air are produced by the shelter of a complete crop of trees, accompanied by a good layer of humus on the ground ?

2. If you desired to plant a (practically) even-aged wood of larch and beech, how could you arrange the planting so as to reduce risk of the larch being injured by the beech from the time the crop begins to form complete cover ?

How would you raise an uneven-aged wood of the same species ?

3. What means may be taken to reduce risk of damage to standing woods by storms ?

4. What trees would you recommend for planting on a sloping area, at a moderate elevation, of the following nature, viz. :—

Section 1. Exposure—north ; soil—a light loam of a good depth resting on a “Trap” formation, such as whinstone.

Section 2. Exposure—north-east ; with a shallow dampish peaty soil resting on clay.

Section 3. Exposure—various ; with a dry sandy peaty soil resting on gravel.

5. State generally the characteristics (such as hardness, elasticity, durability) and the uses of the timber of each of the following species, viz.: oak, beech, sycamore, ash, larch, Scots pine, spruce.

6. Give an account of the arrangements necessary previous to a sale, by private tender, of a mixed crop of standing timber; and draft a set of conditions of sale.

(Two hours allowed.)

FOREST BOTANY AND FOREST ENTOMOLOGY.

Candidates are expected to answer five of the questions—three from the Section of Forest Botany, and two from the Section of Forest Entomology.

(a) FOREST BOTANY.

1. Describe the structure of a rootlet of any Forest tree. Point out the function of the several parts of the rootlet you describe. Classify the British trees according to depth of rooting.

2. Describe from the centre outwards the appearances presented in a transverse section of a ten-year-old stem of any Forest tree. How would you distinguish the wood of *Quercus*, *Castanea*, and *Fagus*?

3. In what form and in what situations is food stored up in a deciduous-leaved tree? Give some account of the process of storage.

4. Distinguish between saprophytism and parasitism. Illustrate by reference to the life-history of particular plants the importance to the Forester of a knowledge of these phenomena.

5. Give an account of the arrangement and form of the flowers in any tree, and describe the process of fertilisation.

(b) FOREST ENTOMOLOGY.

6. What are the "general principles" which you consider should influence the Forester in relation to Insect attack?

7. Draw up a list of Insects you would encourage, and add reasons.

8. Give the life-history of any pest injurious to Larch, and say how you would cope with it.

(Two hours allowed.)

CHEMISTRY.

1. What are the chief physical and chemical properties of sulphur? What is the nature of the gas that is formed when it burns? Describe the kind of injury which it does to vegetation.

2. A red ochreous deposit is frequently seen in ditches and proceeding from drain-pipes: what is it due to? Explain its chemical composition, and the process of its formation.

3. What is the difference between gypsum and limestone? Explain the uses of each, and their relative value for manurial purposes.

4. How can caustic potash be prepared from potashes?

5. Explain why it is that the mercurial column of the barometer sinks on the approach of rainy weather.

(An hour and a half allowed.)

LAND AND TIMBER MEASURING AND SURVEYING;
MECHANICS AND CONSTRUCTION AS APPLIED TO FENCING,
DRAINAGE, BRIDGING, AND ROAD-MAKING.

1. Calculate the cubic contents of an embankment 104 feet 6 inches long, 4 feet deep, 3 feet wide at top with side slopes $1\frac{1}{2}$ horizontal to 1 vertical, and give the result in cubic yards.

2. It is proposed to plant with young trees an enclosure of the following dimensions, namely: 15 chains long by 5 chains broad, the trees to be kept a yard off the fences and a yard apart each way. Find the exact number of trees required, also the number of quick sets at 9 inches apart required to enclose the ground.

3. A drain is to be cut between two points 500 feet apart, the difference of level of the surface between these points being 5 feet. Assuming the surface to have a regular fall, the drain to commence at the low end at 5 feet below the surface and terminate at the high end at 2 feet 6 inches below the surface, what fall would the drain have per 100 feet, and what depth below the surface would it require to be at each 100 feet between the extreme points to give it a regular inclination?

4. Describe with sketches the steps to be taken and work to be done in confining a stream to a regular course, after it has damaged and overflowed its banks when in spate.

5. Describe with sketch the method of draining a field with tiles, the width apart and depth the tiles should be laid, and the probable cost of executing the work.

6. Describe and show cross section of a service road for a farm, fenced 12 feet, and metalled 9 feet wide, and give probable cost per lineal yard of roadway, on the assumption that the materials can be got in the vicinity.

7. Give a short specification of an unclimbable iron fence for a park.

(Two hours allowed.)

ARITHMETIC AND BOOK-KEEPING.

1. Reduce (a) 2 square feet 73 square inches to the decimal of a square yard; and (b) 3 roods 20 poles to the decimal of an acre.

2. Find the contents and value, at 9d. per solid foot, of a piece of timber whose length, breadth, and thickness respectively are $54\frac{1}{2}$ feet, 5 feet, and 2 feet 5 inches.

3. If 125 men can make an embankment 100 yards long, 20 feet wide, and 4 feet high, in 4 days, working 12 hours a day, how many men must be employed to make an embankment 1000 yards long, 16 feet wide, and 6 feet high, in 3 days, working 10 hours a day?

4. How many planks 12 feet 6 inches long, $8\frac{1}{2}$ inches wide, will floor a room 50 feet by 16 feet?

5. Find the cost of 48 square yards 8 square feet 114 square inches, at 13s. 7 $\frac{3}{4}$ d. per square yard.

6. If a piece of ground contains 24 acres, and an enclosure of 17 acres 3 roods be taken out of it, how many perches are there in the remainder?

7. Multiply 81.4632 by .0378, and divide .025075 by 1.003.

8. Describe briefly the books a forester ought to keep, and their nature and use.

(An hour and a half allowed.)

CHEMICAL DEPARTMENT.

Chemist to the Society—Dr A. P. AITKEN, Chemical Laboratory,
8 Clyde Street, Edinburgh.

The object of the Chemical Department is to promote the diffusion of a knowledge of Chemistry as applied to agriculture among the members of the Society, to carry out experiments for that purpose, to assist members who are engaged in making local experiments requiring the direction or services of a chemist, to direct members in regard to the use of manures and feeding-stuffs, to assist them to put the purchase of these substances under proper control, and in general to consider all matters coming under the Society's notice in connection with the Chemistry of Agriculture.

MEMBERS' PRIVILEGES IN RESPECT OF ANALYSES.

The fees of the Chemist for analyses made for members of the Society shall, until further notice, be as follows :—

| | |
|---|------|
| The estimation of <i>one</i> ingredient in a manure or feeding-stuff, | 5s. |
| The estimation of <i>two</i> or <i>more</i> ingredients in do. | 10s. |

These charges apply only to analyses made for agricultural purposes, and for the sole and private use of members of the Highland and Agricultural Society who are not engaged in the manufacture or sale of the substances analysed.

Valuations of manures, according to the Society's scale of units, will be supplied if requested.

MISCELLANEOUS

| | |
|---|--------|
| Analysis of water ¹ to determine purity, hardness, and fitness for domestic use, | £1 0 0 |
| Analysis of agricultural products—hay, grain, ensilage, roots, &c., | 1 0 0 |
| Analysis of soil, to determine fertility and recommendation of manurial treatment, | 2 0 0 |
| Search for poisons in food or viscera, | 2 0 0 |

Samples should be sent (carriage paid) to Dr A. P. Aitken, 8 Clyde Street, Edinburgh.

INSTRUCTIONS FOR SELECTING SAMPLES FOR ANALYSIS.

MANURES.

Four or more bags should be selected for sampling. Each bag is to be emptied out separately on a clean floor, worked through with the spade, and one spadeful taken out and set aside. The four or more spadefuls thus set aside are to be mixed together until a uniform mixture is obtained. Of this mixture one spadeful is to be taken, spread on paper, and still more thoroughly mixed, any lumps which it may contain being broken down with the hand. Of this mixture two samples of about half a pound each should be taken by the purchaser or his agent, in the presence of the seller or his agent or two witnesses (due notice having been given to the

¹ Cases containing bottles for water samples and instructions for sampling are sent from the laboratory on application.

seller of the time and place of sampling), and these samples should be taken as quickly as possible, and put into bottles or tin cases to prevent loss of moisture, and having been labelled, should be sealed by the samplers—one or more samples to be retained by the purchaser, and one to be sent to the chemist for analysis.

FEEDING-STUFFS.

Samples of feeding compounds should be taken in a similar manner.

Samples of cake should be taken by selecting three cakes, breaking each across the middle, and from the broken part breaking off a segment across the entire breadth of the cake. The three segments thus obtained should be wrapped up and sealed by the samplers, and sent for analysis as in the case of manures, and three duplicate segments similarly sealed and labelled should be retained by the purchaser.

SOILS.

Dig a little trench about two feet deep, exposing the soil and subsoil. Cut from the side of this trench horizontal scrapings of the soil down to the top of the subsoil. Catch these on a clean board, and collect in this manner about one pound weight of soil taken from the whole surface of the section. Similar scrapings of subsoil immediately below should be taken and preserved separately. Five or six similarly drawn samples should be taken from different parts of the field, and kept separate while being sent to the chemist, that he may examine them individually before mixing in the laboratory.

VEGETABLE PRODUCTS.

Turnips, &c., 40 bulbs carefully selected as of fair average growth.

Hay, straw, ensilage, &c., should be sampled from a thin section cut across the whole stack or silo, and carefully mixed about; about 2 lb. weight is required for analysis.

Grain should be sampled like manures.

DAIRY PRODUCE.

Milk.—Samples of milk from individual cows should be taken direct from the milk-pail. Average samples from a number of cows should be taken immediately after milking. Samples to be tested for adulteration should not be drawn from the bottom or taken from the top of standing milk, but they should be ladled from the vessel after the milk has been thoroughly mixed.

For most purposes a pint-bottle of milk is a large enough sample.

Butter and Cheese.—About quarter-pound samples are required.

WATERS.

When the water is from a well, it should be pumped for some minutes before taking the sample.

If the well has been standing unused for a long time, it should be pumped for some hours, so that the water may be renewed as far as possible.

If the well has been newly dug or cleaned out, it should be pumped as dry as possible, daily, for a week before taking the sample.

Water from cisterns, tanks, ponds, &c., should be sampled by immersing the bottle entirely under the water, and holding it, neck upwards, some inches below the surface. *Water from the surface should not be allowed to enter the bottle.*

Spring or stream water should not be sampled in very wet weather, but

when the water is in ordinary condition. Such waters should be sampled by immersing the bottle, if possible; but if not deep enough for that purpose, a perfectly clean cup should be used for transferring the water to the bottle.

When the bottle has been filled the stopper should be rinsed in the water before replacing it.

Interference with or disturbance of wells or springs, or the ground in their immediate vicinity, must be carefully avoided during sampling, and for at least twenty-four hours before it.

After a sample has been taken, it should be sent to the laboratory as speedily as possible.

N.B.—Stone jars and old wine bottles are unsuitable for conveying samples. Winchester quarts chemically cleaned should be obtained from the laboratory here.

LOCAL ANALYTICAL ASSOCIATIONS.

With the view of encouraging, as well as regulating the conduct of, Local Analytical Associations, the Society, from 1881 to 1893, contributed from its funds towards their expenses a sum not exceeding £250 annually. In view of the passing of the Fertilisers and Feeding Stuffs Act, 1893, which places upon County Councils the duty of repressing the fraudulent sale of manures and feeding-stuffs, it was decided, at a meeting of the Directors on the 6th of December 1893, to discontinue that grant after the 1st of March 1894.

MANURES—THEIR COMPOSITION AND CHARACTERISTICS.

Nitrate of Soda.—A most valuable nitrogenous manure. Perfectly soluble, and immediately available for the nourishment of the plant. Freely retained by the soil. Rapidly goes down to the subsoil. Benefits deeply-rooting plants. *When much nitrate of soda is frequently applied and unaccompanied by other manures, the soil becomes rapidly exhausted.*

Good samples contain 95 per cent or upwards of pure nitrate of soda, containing about 15½ per cent nitrogen.

Sulphate of Ammonia.—A more concentrated nitrogenous manure than the preceding. Perfectly soluble, but not so rapid in its action as nitrate of soda. It is somewhat firmly retained by the soil, and not so liable as nitrate of soda to be washed out by heavy rains. It is therefore more suitable than nitrate for wet districts.

Good samples contain 95 per cent or more of pure sulphate of ammonia, containing about 19½ per cent nitrogen.

Dried Blood.—A valuable nitrogenous manure, which differs from the above in being insoluble. It must be decomposed in the soil before it yields up its nitrogen to the plant. The nitrogen (10 to 23 per cent) is in the form of albumen.

Horn-dust—Keronikon.—An insoluble nitrogenous manure, containing about 14 per cent nitrogen. Slower than dried blood. Its efficacy as a manure increases the more finely it is ground.

Horn, when in the form of chips or coarse shavings, decomposes extremely slowly, and is not suitable for application as a manure.

Shoddy or Wool-waste.—An insoluble nitrogenous material used chiefly by manure manufacturers as a source of ammonia in dissolved manures. Contains 5 per cent or upwards of nitrogen. It is a useful manure when dissolved.

Leather.—A very insoluble nitrogenous material, yielding about 9 per

cent of ammonia, used by manure manufacturers after being melted and ground, but of little value until it has been dissolved.

Peruvian Guano.—A general manure formed of the excrements of fish-eating birds, and containing nitrogenous compounds, phosphates, and potash.

High-class Peruvian guano is rich in nitrogenous matter, a large proportion of which is soluble. A powerful manure, yielding from 7 to 10 per cent nitrogen, a large part of which is immediately available. Phosphates as plant-food, seldom exceeding 30 per cent, but from one-quarter to one-half of the phosphates are soluble. Containing potash, usually about 3 per cent.

Low-class Peruvian guano is poor in nitrogenous matter, yielding only from $2\frac{1}{2}$ to 4 per cent nitrogen. The phosphates are correspondingly high—viz., from 30 to 50 per cent—but the proportion of soluble phosphate is much smaller than in high-class Peruvian guano. Potash occurs to a very small extent—viz., about 1 to 3 per cent.

Genuine Peruvian guano frequently contains a large proportion of stony insoluble matter. It ought to be riddled before purchasing.

Fortified Peruvian Guano,—also called by various names, such as *improved, equalised*, &c.—Such guanos are mixtures, with low-class Peruvian guano for a basis. Sulphate of ammonia is added, and perhaps also other nitrogenous matter, to bring them up to the guaranteed analysis.

Dissolved Peruvian Guano.—This is usually Peruvian guano dissolved in sulphuric acid, and fortified with sulphate of ammonia so as to make a strong, active manure.

Ichaboe Guano.—A true guano, of recent formation. It is very rich in nitrogenous matter, which contains from 8 to 13 per cent of nitrogen, but a large part of the nitrogenous matter is in the form of feathers, which are insoluble and of low manurial value, otherwise it resembles high-class Peruvian guano. The total phosphates vary from 18 to 30 per cent, of which from a fourth to a half is usually soluble. There is seldom as much as 2 per cent potash present.

Fish Guano.—Derived from fish-curing yards, and consisting of the heads and offal of fish, dried and ground. Properly speaking, it is not a guano. The name guano is properly applied only to the dung of birds and some other animals.

High-class fish-guano contains nitrogenous matter, containing from 8 to $9\frac{1}{2}$ per cent of nitrogen, but it is in the form of insoluble albuminous compounds, which, however, decompose and become available as plant-food. The phosphates range from 18 to 30 per cent, and are all insoluble.

Low-class fish-guanos are substances like the preceding, but containing less nitrogenous matter and more phosphates. They are simply fish-bone manures, with somewhat more ammonia and less phosphate than ordinary bone-meal, and having no real resemblance to a guano.

Fish-guanos are usually impregnated with fish-oil, which detracts from the value of the manure. The oil should not exceed 3 per cent.

Frey-Bentos Guano.—The dried and ground residue and *debris* of animals after the extraction of "Liebig's Extract." It is not a guano. There are various grades of this manure. One contains much bone matter, another a good deal of horn. The best manure is derived from muscular fibre, containing about 11 per cent nitrogen and about 5 per cent phosphate. Sometimes called *meat-meal*. It is a strong nitrogenous manure.

Bone-meal.—Chiefly a phosphatic manure, but containing also nitrogenous matter. Phosphates range from 50 to 55 per cent, according to the purity of the bones, and are insoluble. The nitrogenous matter is also insoluble, and contains from $3\frac{1}{2}$ to 4 per cent of nitrogen. The higher the phosphates the lower the ammonia, and *vice versa*. The finer ground it is, the more speedy is its action.

Bone-dust.—A coarser ground bone than the preceding.

Crushed Bones.—Still coarser ground.

Steamed Bone Flour.—Bones which have been subjected to steam at high pressure for the extraction of glue or gelatine. The residue contains from 56 to 65 per cent phosphates, and about 1 per cent of nitrogen. It is white-coloured and friable, and can be crushed with the hand. It is able to be, and ought to be, ground to a fine flour.

Pure Dissolved Bones.—Bones dissolved in sulphuric acid. It contains usually less than 20 per cent soluble phosphate, about 10 to 20 per cent of insoluble phosphate, and contains from $2\frac{1}{2}$ to 3 per cent nitrogen. A large proportion of the insoluble phosphate may consist of "precipitated" phosphate, which is quite as useful as soluble phosphate.

Dissolved Bone Manures.—These are compound manures, consisting of any mixture of phosphatic and nitrogenous materials which can be dissolved, with some admixture of bone, so as to produce a manure containing from 15 to 30 per cent soluble phosphates, and from 1 to $2\frac{1}{2}$ per cent nitrogen. *Dissolved bone manures* frequently contain some bone material that has not been dissolved.

Superphosphates.—Phosphates dissolved with sulphuric acid. Their composition varies according to the richness of the phosphate from which they are made, and the extent to which they have been dissolved. If mixed with nitrate of soda, except in very small quantity, it causes loss from escape of nitrous fumes, which are injurious when breathed.

High-class superphosphates are made from phosphates containing a high percentage of phosphate of lime, and are very thoroughly dissolved. They should contain between 35 and 40 per cent soluble phosphate.

Low-class superphosphates usually contain 26 to 28 per cent soluble phosphate.

Mineral Phosphates exist in great variety, and contain very various proportions of phosphate of lime—viz., from 20 to 90 per cent. They are of use as manures only when they are ground to the finest flour.

Thomas-Slag, Basic Cinder, or Slag Phosphate Meal.—A substance obtained as a waste product in the dephosphorising of steel. It contains from 30 to 40 per cent phosphate of lime, and should be manufactured into a powder of extreme fineness, 80 per cent at least passing through No. 100 wire-cloth. It is more soluble and available for plant-food than ground mineral phosphates. It may be mixed with nitrate of soda, but *not with sulphate of ammonia*, because it contains caustic lime, which would cause loss of ammonia.

Compound Manures.—These are general manures containing nitrogenous matter, phosphates, and potash, and their value depends not only on the amounts of these constituents, but also on their fineness of division, their solubility, and the sources from which their ingredients are derived.

The general character of a few of the more common of these may be indicated thus:—

Turnip Compounds.—These usually contain from 25 to 35 per cent phosphates, of which the half or more is soluble, and nitrogenous matter, containing $1\frac{1}{2}$ to 3 per cent nitrogen, and sometimes 1 or 2 per cent of potash.

Potato Compounds.—These are somewhat like the preceding, but contain usually less phosphate and a little more nitrogen (from 4 to 7 per cent); sometimes they contain no potash, but more frequently about 3 or 4 per cent is present, and in some instances twice as much.

Bean Compounds.—These may contain from 10 to 20 per cent phosphates, nitrogenous matter containing 1 to 3 per cent nitrogen, and usually a considerable proportion of potash, often as much as from 10 to 20 per cent.

Cereal Compounds.—These usually contain about 20 per cent phosphates, mostly soluble, and nitrogenous matter, partly as nitrates, containing 3 to 6 per cent nitrogen, and they may also contain potash.

Grass Compounds.—These are somewhat like the preceding, but may contain less phosphates and more nitrogen, part of which is usually in the form of nitrate.

NOTES REGARDING MANURIAL CONSTITUENTS.

The three important constituents of purchased manures are phosphates, nitrogenous matter, and potash salts.

The phosphates are described in analytical reports as containing phosphoric acid equal to so much "phosphate of lime"; the nitrogenous matter as containing so much nitrogen equal to so much "ammonia"; the potash salts as containing so much anhydrous "potash."

1. **PHOSPHATES.**—The phosphates occurring in manures are known to chemists as ortho-phosphates, and they are of three kinds, which may be thus represented:—

| | | | | | |
|-----------------------------|---------------------|-----------------------------|---------------------|------------------------------|---------------------|
| Lime } Lime } Lime } | Phosphoric acid. | Lime } Lime } Water } | Phosphoric acid. | Lime } Water } Water } | Phosphoric acid. |
| <i>Tricalcic phosphate.</i> | | <i>Dicalcic phosphate.</i> | | <i>Monocalcic phosphate.</i> | |

Tricalcic phosphate is the natural phosphate occurring in bones and mineral phosphates. It is insoluble in water, and contains, when pure, about 46 per cent phosphoric acid.

Monocalcic phosphate is formed from tricalcic phosphate by dissolving it in acid, which takes away two-thirds of its lime, and replaces it with water. It is soluble in water, and contains, when pure, about 60 per cent phosphoric acid.

Dicalcic phosphate is intermediate between these two, and is formed by their union. This union occurs in the case of phosphates which have been treated with less acid than is required to dissolve them entirely—*e.g.*, in pure dissolved bones, and it is usually called *precipitated* or *reverted* phosphate. It contains, when pure, about 52 per cent phosphoric acid, is insoluble in water, but soluble in certain saline solutions, and is nearly as active manurally as monocalcic phosphate.

"Soluble phosphate" ought, strictly speaking, to mean monocalcic ortho-phosphate, but according to trade usage it does not. It means that amount of tricalcic phosphate which by means of acid has been converted into monocalcic phosphate, or in other words, the insoluble phosphate that has been rendered soluble. There is a certain advantage in expressing all kinds of phosphate in terms of their equivalent of tricalcic phosphate.

Phosphates of magnesia, of iron, and of alumina, when occurring in small proportion, are not usually estimated separately, but are reckoned as phosphate of lime.

2. **NITROGEN** occurs in manures mostly in three forms—Ammonia salts, nitrates, and albuminoid matter.

Ammonia sulphate (pure) contains $21\frac{1}{5}$ per cent nitrogen, or $25\frac{3}{4}$ per cent ammonia.

Ammonium chloride (pure) contains 26 per cent nitrogen, or $31\frac{3}{4}$ per cent ammonia.

Nitrate of soda (pure) contains $16\frac{1}{2}$ per cent nitrogen, equal to 20 per cent ammonia.

Albuminoid matter contains from 14 to 16 per cent nitrogen, equal to from 17 to 19 per cent ammonia, most of which sooner or later becomes available as plant-food.

3. POTASH occurs mostly in the form of soluble salts, and should be reckoned as anhydrous potash (K_2O).

Sulphate of potash (pure) contains potassium = 54 per cent anhydrous potash.

Muriate of potash (pure) contains potassium = fully 63 per cent anhydrous potash.

FEEDING STUFFS—THEIR COMPOSITION AND CHARACTERISTICS.

These are concentrated forms of fodder, whose value depends upon their *albuminoid matter*, *oil*, and *carbohydrates* (such as starch and sugar).

LINSEED (seed of *Linum usitatissimum*, Common Flax).—Bombay seed large and pale; Baltic seed smaller and dark brown, more liable to impurities than Bombay seed; should be crushed and plotted before feeding. Useful in calf fodders, also for milk-giving, and in the last stage of masting. Quantity, 1 to 3 lb. per 1000 lb. L.W.

LINSEED-CAKE.—Much approved feeding cake; merits well known. Home-made cake usually softer and more oily than foreign. Very hard-pressed cake is low in oil, and not so easily eaten and digested. Linseed-cakes usually impure. Chief impurities, locust-beans added to give flavour and relish, rape-seed, less frequently chaff, and weed-seeds from badly screened seed. Should be broken to small pieces before feeding. Quantity, 2 to 6 lb. per 1000 lb. L.W.

RAPE-CAKE (seed of *Brassica napus* and *B. campestris*).—It has a greenish mottled appearance and a bitter taste, which renders it distasteful to cattle at first. Should be given in small quantity to begin with. Not suited for calves. When given to milch cows, the quantity should not exceed 2 or 3 lb. per head per day, or it will give a disagreeable taste to milk and butter. Sometimes very impure. A dangerous impurity is mustard-seed. May be detected by steeping in cold water for some hours, and noting smell of mustard. Danger may be avoided by steeping the ground cake in *boiling* water.

PUPPY-CAKE (seed of *Papaver somniferum*).—Contains a savoury and easily digestible oil. May be fed to cattle in considerable quantity—5 to 8 lb. per head per day. More than 5 lb. per head per day to milch cows detracts from flavour of butter.

HEMP-CAKE (seed of *Cannabis sativa*).—Not much used for feeding. Not so digestible as the above, owing to abundance of woody fibre (25 per cent). Fed chiefly to horses and sheep. To milch cows not more than 1 lb. per head per day. Apt to grow mouldy in summer.

SUNFLOWER-CAKE (seed of *Helianthus annuus*).—Relished by stock, and well digested.

COTTON-CAKE (seed of *Gossypium hirsutum*, &c.). *Undecorticated*.—Best quality from Egyptian and Sea Island seed. Inferior qualities are woolly, and to be avoided. Husk has astringent properties, and is a good cure for *scour*. Should be ground to the size of linseed. Not very digestible, owing to abundance of woody fibre (28 per cent). Should be used freshly made, because liable to mould on keeping.

Decorticated—viz., cotton-cake deprived of the husk.—A very concentrated and powerful bye-fodder. Should be given with caution, crushed fine, and mixed with Indian corn, oats, or other farinaceous

food. Large quantity is injurious, and may even be fatal. Very variable in composition. Frequently very hard pressed, and therefore indigestible. When freshly made, softly pressed, and of good quality, it is a valuable bye-fodder. Oil very bland and digestible; used to adulterate olive-oil.

SESAME-CAKE (seed of *Sesamum orientale*).—Seed imported from India. Excellent bye-fodder, easily digested, much relished by all kinds of stock. Favourable for milk-giving, and also for masting. Oil bland and digestible, and much in favour for making margarine.

RICE-MEAL (seed of *Oryza sativa*).—The meal is a bye-product obtained in preparing rice for the market. A very good, safe, and acceptable fodder, but less concentrated than ordinary oilcakes. Varies very much in quality, and frequently adulterated with meal derived from rice husks. Much relished by stock, and useful for milch cows as well as for fattening animals.

RYE-MEAL.—Is the bran of rye, and rather more concentrated than wheat bran. It is very good fodder for cattle and sheep, but not for horses.

PALM-KERNEL CAKE.—An excellent, palatable, and easily digested bye-fodder. Especially good for milch cows. Increases the proportion of fat in milk. Puts a finish upon fattening stock. When ground to powder and most of the oil extracted, it is sold as *Palm-kernel meal*, a much relished and digestible bye-fodder. A useful addition to calf-meals.

EARTH-NUT CAKE.—The pressed seed of a leguminous plant (*Arachis hypogæa*). The most concentrated of all cakes, containing from 45 to 50 per cent albumen and 6 to 9 per cent of oil. It is very palatable and digestible. A nutritious fodder when given in moderation. Apt to be contaminated with hair, and liable to rot on keeping if badly made.

FLESH-MEAL.—Residue obtained in the manufacture of *Liebig's Extract of Beef*. A highly nitrogenous bye-fodder, most suitable for enriching a too farinaceous dietary, such as potatoes. Much used in that way as a swine fodder. Easily digested, and readily accepted by cattle.

FISH-MEAL.—Bye-product of fish-curing yards, made chiefly from the heads of cod and tusk. Resembling fish-guano in composition, but somewhat variable. Highly phosphatic, and therefore useful as a bye-fodder to young growing cattle. Ratio, from 1 to 3 lb. per head per day.

HERRING-MEAL.—A very oily fodder, useful as an adjunct to the dietary of milch cows. Quantity, 1 to 4 lb. per head per day.

LOCUST-BEANS.—*Carob Bean*.—A sugary fodder, most palatable and acceptable to all kinds of stock. Used to mix with oilcakes and meals so as to improve their flavour.

DRIED GRAINS.—The draff from distilleries and breweries dried so as to contain only about 10 per cent water. It is a first-class feeding-stuff if of good quality, but the qualities differ considerably.

THE COMPOSITION OF FEEDING STUFFS.

The following is the average composition of genuine cakes and meals in common use:—

| | Albuminoids. | Oil. | Carbohydrates. |
|--------------------------|--------------|------|----------------|
| Linseed-cake . . . | 29 | 11 | 32 |
| Rape-cake . . . | 31 | 10 | 30 |
| Poppy-cake . . . | 35 | 10 | 22 |
| Hemp-cake . . . | 30 | 8½ | 17 |
| Sunflower-cake . . . | 33 | 9 | 27 |
| Cotton-cake . . . | 28 | 7½ | 30 |
| „ (decorticated) | 44 | 15 | 20 |
| Sesame-cake . . . | 37 | 13 | 21 |
| Rice-meal . . . | 11 | 10 | 50 |
| Paisley meal . . . | 15 | 9 | 60 |
| Rye-meal . . . | 14.5 | 3½ | 60 |
| Wheat-bran . . . | 13.5 | 3½ | 56 |
| Barley-bran . . . | 15 | 7 | 50 |
| Palm-kernel cake . . | 17 | 10 | 41 |
| Palm-kernel meal . . | 19 | 3½ | 44 |
| Earth-nut cake (shelled) | 47 | 7½ | 25 |
| Flesh-meal . . . | 71 | 13 | ... |
| Fish-meal . . . | 50 | 4 | ... |
| Herring-meal . . . | 40 | 20 | ... |
| Locust-bean meal . . | 4 | 2 | 74 |
| Linseed . . . | 21 | 37 | 20 |
| Dried grains . . . | 20 | 8 | 50 |

USEFUL FACTORS.

| Amount of | Multiplied by | Gives corresponding amount of |
|--------------------------------------|---------------|---------------------------------|
| Nitrogen | 1.214 | Ammonia. |
| " | 6.3 | Albuminoid matter. |
| " | 4.714 | Sulphate of ammonia. |
| " | 4.50 | Nitric acid. |
| " | 6.071 | Nitrate of soda. |
| Ammonia | .824 | Nitrogen. |
| " | 3.882 | Sulphate of ammonia. |
| " | 3.706 | Nitric acid. |
| " | 5.0 | Nitrate of soda. |
| Potash (anhydrous) . . | 1.85 | Sulphate of potash. |
| " | 1.585 | Muriate of potash. |
| Phosphoric acid (anhydrous) . | 2.183 | ¹ Phosphate of lime. |
| " " | 1.4 | Biphosphate. |
| " " | 1.648 | ² Soluble phosphate. |
| Soluble phosphate ² . . . | 1.325 | ¹ Phosphate of lime. |
| Biphosphate | 1.566 | " |
| Lime | 1.845 | " |
| " | 1.786 | Carbonate of lime. |
| Chlorine | 1.648 | Chloride of sodium. |

¹ Tricalcic ortho-phosphate ($3\text{CaO}, \text{P}_2\text{O}_5$).

² Monocalcic ortho-phosphate ($\text{CaO}, 2\text{H}_2\text{O}, \text{P}_2\text{O}_5$).

FORMS OF GUARANTEE.

GUARANTEE OF MANURE.

I guarantee that the manure called.....and sold by me to
.....contains a minimum of—

Soluble phosphoric acid = Phosphate of lime dissolved per cent.

Insoluble phosphoric acid = Phosphate of lime undissolved ... per cent.

Potash salts . . = Potash (K_2O) . . . per cent.

Total nitrogen . . = Ammonia . . . per cent.

Signature of seller.....

Date.....18...

GUARANTEE OF FEEDING STUFF.

I guarantee that the feeding-stuff called.....and sold by me to
.....contains a minimum of—

... per cent albuminoids.

... per cent oil.

... per cent carbohydrates.

Signature of seller.....

Date.....18...

UNITS TO BE USED IN DETERMINING THE COMMERCIAL
VALUE OF MANURES.¹

Terms—CASH, including Bags gross weight—not including Carriage.

N.B.—These units are based on the present RETAIL PRICES at principal seaports. When these units are multiplied by the percentages in the analysis of a Manure, they will produce a value representing very nearly the cash price at which one SINGLE TON may be bought in fine sowing condition. Larger purchases may be made on more favourable terms.

For Season 1896.

| Items to be Valued. | Guanos. | | Scrap Manures. | | Bone Manures. | | | Superphosphates. |
|-----------------------------------|----------|---------------------|----------------|--------|---------------|---------------------|---------------------------------|------------------|
| | Islaboe. | Peruvian (Riddled). | Fish. | Flesh. | Bone-Meal. | Steamed Bone Flour. | Dissolved or Vitriolized Bones. | |
| Phosphates dissolved | 2/3 | 2/3 | { .. | .. | .. | .. | 2/6 | 1/0 |
| " undissolved | | | { 1/- | 1/- | 1/2 | 1/3 | 1/6 | .. |
| Nitrogen | 18/3 | 20/- | 10/- | 10/8 | 10/- | 10/- | 12/1 | .. |
| or Ammonia | 15/- | 16/6 | 8/3 | 8/9 | 8/3 | 8/3 | 10/- | .. |
| Prices per ton, March 1896 { From | 230/- | 220/- | 80/- | 90/- | 85/- | 85/- | 90/- | 25% = 44/- |
| | 250/- | 230/- | 140/- | 140/- | 95/- | 90/- | 95/- | 86% = 63/- |

¹ See note, p. 40.

CASH PRICES (MARCH).

| MANURES | | | |
|------------------------------------|-----------|---------------|------------|
| | Guarantee | Price per Ton | Unit. |
| | Per cent | £ s d | |
| Sulphate of ammonia, 95 per cent . | 20 N | 9 15 0 | N = 3/0 |
| Nitrate of soda, 95 per cent . | 15½ " | 8 5 0 | " = 10/8 |
| Castor cake dust . . . | 4 5 " | 3 0 0 | " = 13/4 |
| Dried blood . | 14 | 7 10 0 | = 10 8 |
| Muriate of potash, 80 per cent | 50 Pot | 8 15 0 | Pot = 3/6 |
| Sulphate of potash, 50 per cent | 27 " | 5 0 0 | " = 3/0 |
| Kumt . | 12 " | 2 0 0 | " = 3/4 |
| Ground Charleston phos | 57 Phos | 2 2 6 | Phos = 0/0 |
| Belgian phosphate | 40 | 1 12 0 | = 0/8 |
| Algerian phosphate | 64 " | 2 5 0 | " = 0/8½ |
| Thomas slag phosphate | 57 " | 2 5 0 | " = 1/2½ |

| FEEDING STUFFS | | | | Price per Ton in bags |
|--------------------------|----------|-----|-------------------|--------------------------|
| | Analyses | | | |
| | Album | Oil | Carbo hydrates | |
| Linseed cake | 28 | 10 | 95 | £ s d 6 0 0 |
| " Canadian | 28 | 10 | 5 | 5 5 0 |
| Decorticated cotton cake | 40 | 10 | 20 | 5 10 0 |
| Undecorticated do | 24 | " | 25 | 3 12 6 |
| Rape cake | 22 | 10 | 27 | 4 15 0 |
| Bean meal | 20 | 2 | 50 | 5 0 |
| Locust bean meal | 1 | 2 | 70 | 4 2 6 |
| Dried grains | 20 | 5 | 50 | 3 10 0 |
| Barley bran | 1 | 5 | 50 | 2 15 0 |
| Indian corn | 10 | 5 | 55 | 4 5 0 |
| Parsley meal | 15 | 9 | 60 | 3 15 0 |
| Linsed (whole) | 20 | 25 | 14 | 10 0 0 |
| Linsed oil | | | | 20 0 0 |
| Molasses | | | | 4 10 0 |

CLASSIFICATION OF MANURES.

| | | |
|-----------------------------------|---|---|
| Fish scrap . . . | { | Finely ground, and containing not more than 3 per cent oil. |
| Bone-meal . . . | { | Genuine bone-meal contains from 48 per cent to 55 per cent phosphates, and from $3\frac{1}{2}$ per cent to 4 per cent nitrogen. If phosphates are low nitrogen will be high, and conversely. |
| Steamed bone-flour . . | { | Ground to flour and containing about 60 per cent phosphates, and about 2 per cent nitrogen |
| Dissolved bones . . | { | Must be pure—i.e., containing nothing but natural bones and sulphuric acid. |
| Mixtures . . . | { | To be valued according to the unit values (as given above) of the ingredients of which they are guaranteed <i>and also found</i> to be composed, with an addition of from 5 to 10 per cent, according to the fineness of their manufacture. |
| Thomas-slag and ground phosphates | { | Fineness of grinding is of paramount importance. The coarsest kind used should be so finely ground that 80 per cent pass through a sieve of 10,000 holes per sq. inch. |

INSTRUCTIONS FOR VALUING MANURES.

The commercial values of manures are determined by means of the UNITS in the following manner:—

Take the analysis of the manure, and look for the following substances:—

| | |
|---|--|
| Phosphates dissolved (or soluble phosphate) | } No other items but these are to be valued. |
| „ undissolved (or insoluble „) | |
| Nitrogen | |
| Potash | |

Should the analysis or the guarantee not be expressed in that way, the chemist or the seller should be asked to state the quantities in these terms.

Suppose the manure is bone-meal:—

An ordinary bone-meal will contain about 50 per cent phosphate and 4 per cent nitrogen. The units for bones are 1s. 2d. for phosphate and 10s. for nitrogen. Therefore the value is—

| | |
|--|---------|
| Insol. phosphate, 50 times 1s. 2d., equal to | £2 18 4 |
| Nitrogen, 4 „ 10s., „ | 2 0 0 |

Say £4 18 0 per ton.

Suppose the manure is dissolved or vitriolated bones:—

It must be guaranteed “pure.”

The units in the Schedule are 2s. 6d. for soluble phosphate, 1s. 6d. for insoluble phosphate, and 12s. 1d. for nitrogen.

The analysis will be about 16 per cent soluble phosphate, 20 per cent insoluble phosphate, and $2\frac{1}{2}$ per cent nitrogen. In that case the value would be—

| | |
|--|--------|
| Sol. phosphate, 16 times 2s. 6d., equal to | £2 0 0 |
| Insol. „ 20 „ 1s. 6d., „ | 1 10 0 |
| Nitrogen, $2\frac{1}{2}$ „ 12s. 1d., „ | 1 10 2 |

Say £5 0 0 per ton.

Suppose the manure is a superphosphate,—say an ordinary superphosphate, with 28 per cent soluble phosphate and 3 per cent insoluble phosphate. It is valued thus—

Sol. phosphate, 28 times 1s. 9d., equal to, say, £2, 9s. per ton.
Insoluble phosphate is not valued in a superphosphate.

Note.—The units have reference solely to the COMMERCIAL VALUES of Manures, and not to their AGRICULTURAL VALUES.

Thus, in stating soluble phosphate in dissolved bones at 2s. 6d. per unit, and that in superphosphate at 1s. 9d., it is meant that these are the prices per unit at which soluble phosphate can be bought in these two manures; but it does not mean that the soluble phosphate in the one is 9d. per unit better as a manure than that in the other. It is probably no better.

BOTANICAL DEPARTMENT.

Consulting Botanist to the Society—A. N. M'ALPINE,
 60 John Street, Glasgow.

The Society have fixed the following rates of charge for the examination of plants and seeds for the *bona fide* and individual use and information of members of the Society (not being seedsmen), who are particularly requested, when applying to the Consulting Botanist, to mention the kind of examination they require, and to quote its number in the subjoined schedule. The charge for examination must be paid at the time of application, and the carriage of all parcels must be prepaid.

Scale of Charges.

1. A report on the purity, amount, and nature of foreign materials, 2s.
2. On the germinating power of a sample of seed, 2s.
3. Determination of the species of any weed or other plant, or of any vegetable parasite, with a report on its habits and the means for its extermination or prevention, 5s.
4. Report on any disease affecting farm crops, 5s.
5. Determination of the species of any natural grass or fodder plant, with a report on its habits and pasture or feeding value, 1s.

The Consulting Botanist's Reports are furnished to enable members—purchasers of seeds and corn for agricultural purposes—to test the value of what they buy, and are not to be used or made available for advertising or trade purposes by seedsmen or otherwise.

Instructions for Selecting and Sending Samples.

In sending seed or corn for examination, the utmost care must be taken to secure a fair and honest sample. In the case of grass seeds, the sample would be drawn from the centre of the sack or bag, and in all cases from the bulk delivered to the purchaser. If anything supposed to be injurious or useless exists in the corn or seed selected, samples should also be sent.

When possible, at least one ounce of grass and other small seeds should be sent, and two ounces of cereals or larger seeds. The exact name under which the seed has been bought (but preferably, a copy of the invoice) should accompany the sample.

Grass seeds should be sent at least four weeks, and clover seeds three weeks, before they are to be used.

In collecting specimens of plants, the whole plant should be taken up and the earth shaken from the roots. If possible, the plants must be in flower or fruit. They should be packed in a light box, or in a firm paper parcel.

Specimens of diseased plants or of parasites should be forwarded as fresh as possible. Place them in a bottle, or pack them in tinfoil or oil-silk.

All specimens should be accompanied with a letter specifying the nature of the information required, and stating any local circumstances (soil, situation, &c.) which, in the opinion of the sender, would be likely to throw light on the inquiry.

It is strongly recommended that members purchasing seeds should insist—

(1) Upon having from the seller a guarantee stating the purity and germination of the seed supplied.

(2) That the bulk be same as sample.

(3) That it contain not more than 5 per cent other than the species ordered.

If the purity and germination of the seed is not known, it is impossible to tell either its money value or the proper amount to be sown.

It is also strongly recommended that the purchase of prepared mixtures should be avoided, and the different seeds to be used should be purchased separately.

Parcels or letters containing seeds or plants for examination (carriage or postage paid) must be addressed to Professor M'Alpine, Botanical Laboratory, 60 John Street, Glasgow.

DAIRY DEPARTMENT.

The Society established in 1885 a Dairy Department, to promote the dairy interests.

During 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, and 1894, the Society placed at the disposal of the Committee a sum of £100 to aid local efforts in providing Technical Education in Dairying.

In the years stated below the grants have been allocated as follows :—

| Branch. | 1890. | 1891. | 1892. | 1894. |
|-------------------------------------|----------|----------|----------|---------|
| Royal Northern Society . . . | ... | £20 0 0 | £20 0 0 | .. 0 0 |
| Angus and Mearns Dairy School . . . | ... | 20 0 0 | 20 0 0 | £20 0 0 |
| Scottish Dairy Institute, Kil- | £100 0 0 | 60 0 0 | 60 0 0 | 60 0 0 |
| marnock } | | | | |
| | £100 0 0 | £100 0 0 | £100 0 0 | £80 0 0 |

PREMIUMS.

GENERAL REGULATIONS FOR COMPETITORS.

1. It is to be distinctly understood that the Society is not responsible for the views, statements, or opinions of any of the writers whose papers are published in the 'Transactions.'

2. All reports must be legibly written, and on one side of the paper only; they must specify the number and subject of the Premium for which they are in competition; they must bear a distinguishing motto, and be accompanied by a sealed letter, similarly marked, containing the name and address of the reporter—initials must not be used.

3. No sealed letter, unless belonging to a report found entitled to at least one-half of the Premium offered, will be opened without the author's consent.

4. Reports for which a Premium, or not less than one-half of it, has been awarded, become the property of the Society, and cannot be published in whole or in part, nor circulated in any manner without the consent of the Directors. All other papers will be returned to the authors if applied for within twelve months.

5. The Society is not bound to award the whole or any part of a Premium.

6. All reports must be of a practical character, containing the results of the writer's own observation or experiment, and the special conditions attached to each Premium must be strictly fulfilled. General essays, and papers compiled from books, will not be rewarded or accepted. Weights and measurements must be indicated by the imperial standards.

7. The Directors, before or after awarding a Premium, shall have power to require the writer of any report to verify the statements made in it.

8. The decisions of the Board of Directors are final and conclusive as to all matters relating to Premiums, whether for Reports or at General or District Shows; and it shall not be competent to raise any question or appeal touching such decisions before any other tribunal.

9. The Directors will welcome papers from any Contributor on any suitable subject not included in the Premium List; and if the topic and the treatment of it are both approved, the writer may be remunerated, and his paper published.

CLASS I.

REPORTS.

SECTION 1.—THE SCIENCE AND PRACTICE OF
AGRICULTURE.

FOR APPROVED REPORTS.

1. On the results of experiments for fixing and retaining the volatile and soluble ingredients in Farmyard Manure—Twenty Sovereigns. To be lodged by 1st November in any year.

The Report must detail the treatment adopted to fix and retain these ingredients—the materials used for that purpose, and the quantity and cost thereof—comparative analyses of the manure with and without the treatment, and also a statement of the crops grown with manure and without such treatment, must be given by the Reporter. The experiments to have extended over at least two years and crops.

2. On experiments for ascertaining the actual addition of weight to growing or fattening Stock, by the use of different kinds of food—Twenty Sovereigns. To be lodged by 1st November in any year.

The attention of the experimenter is directed to turnips, carrots, beet, mangel-wurzel, potatoes, cabbage, as well as to beans, oats, barley, wheat, Indian corn, linseed, oilcake or rape-cake, and to the effect of warmth and proper ventilation, and the difference between food cooked and raw. The above roots and other kinds of food are merely suggested; competitors are neither restricted to them nor obliged to experiment on all of them.

When experiments are made with linseed and cake, attention should be paid to the comparative advantages, economically and otherwise, of the substance in these two states.

Before commencing the comparative experiments, the animals must be fed alike for some time previously.

The progress of different breeds may be compared. This will form an interesting experiment of itself, for Reports of which encouragement will be given.

N.B.—The experiments specified in the two previous subjects must be conducted over a period of not less than three months. No lot shall consist of fewer than four Cattle or ten Sheep. The animals selected should be of the same age, sex, and breed, and as nearly as possible of the same weight, condition, and maturity. The live weight before and after the experiment must be stated, and if killed, their dead weight and quantity of tallow.

3. On any useful practice in Rural Economy adopted in other countries, and susceptible of being introduced with advantage into Scotland—The Gold Medal. To be lodged by 1st November in any year.

The purposes chiefly contemplated by the offer of this premium is to induce travellers to notice and record such particular practices as may seem calculated to benefit Scotland. The Report to be founded on personal observation.

SECTION 2.—ESTATE IMPROVEMENTS.

FOR APPROVED REPORTS.

1. By the Proprietor in Scotland who shall have executed the most judicious, successful, and extensive Improvement—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

Should the successful Report be written for the Proprietor by his resident factor or farm manager, a Minor Gold Medal will be awarded to the writer in addition to the Gold Medal to the Proprietor.

The merits of the Report will not be determined so much by the mere extent of the improvements, as by their character and relation to the size of the property. The improvements may comprise reclaiming, draining, enclosing, planting, road-making, building, and all other operations proper to landed estates. The period within which the operations may have been conducted is not limited, except that it must not exceed the term of the Reporter's proprietorship.

2. By the Proprietor or Tenant in Scotland who shall have reclaimed within the ten preceding years not less than forty acres of Waste Land—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

3. By the Tenant in Scotland who shall have reclaimed within the ten preceding years not less than twenty acres of Waste Land—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

4. By the Tenant in Scotland who shall have reclaimed not less than ten acres within a similar period—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November in any year.

The Reports in competition for Nos. 3, 4, and 5 may comprehend such general observations on the improvement of waste lands as the writer's experience may lead him to make, but must refer especially to the lands reclaimed—to the nature of the soil—the previous state and probable value of the subject—the obstacles opposed to its improvement—the details of the various operations—the mode of cultivation adopted—and the produce and value of the crops produced. As the required extent cannot be made up of different patches of land, the improvement must have relation to one subject; it must be of profitable character, and a rotation of crops must have been concluded before the date of the Report. *A detailed statement of the expenditure and return and a certified measurement of the ground are requisite.*

5. By the Proprietor or Tenant in Scotland who shall have improved within the ten preceding years the Pasturage of not less than thirty acres, by means of top-dressing, draining, or otherwise, without tillage, in situations where tillage may be inexpedient—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

6. By the Tenant in Scotland who shall have improved not less than ten acres within a similar period—The Minor Gold Medal. To be lodged by 1st November in any year.

Reports in competition for Nos. 5 and 6 must state the particular mode of management adopted, the substances applied, the elevation and nature of the soil, its previous natural products, and the changes produced.

SECTION 3.—HIGHLAND INDUSTRIES AND FISHERIES.

FOR APPROVED REPORTS.

1. The best mode of treating native Wool; cleaning, carding, dyeing, spinning, knitting, and weaving by hand in the Highlands and Islands of Scotland—Five Sovereigns. To be lodged by 1st November 1896.

SECTION 4.—MACHINERY.

FOR APPROVED REPORTS.

SECTION 5.—FORESTRY DEPARTMENT.

FOR APPROVED REPORTS.

1. On Plantations of not less than eight years' standing formed on deep peat-bog—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November 1896.

The premium is strictly applicable to deep peat or flow moss; the condition of the moss previous to planting, as well as at the date of the Report, should, if possible, be stated.

The Report must describe the mode and extent of the drainage, and the effect it has had in subsiding the moss—the trenching, levelling, or other preliminary operations that may have been performed on the surface—the mode of planting—kinds, sizes, and number of trees planted per acre—and their relative progress and value, as compared with plantations of a similar age and description grown on other soils in the vicinity.

2. On the Life-History of any Insect or Tribe of Insects which is injurious to British Forest Trees (*e.g.*, *Scolytus destructor*, of the Elm)—Fifteen Sovereigns. To be lodged by 1st November 1896.

The means for guarding against or destroying these pests to be mentioned, and the Report to be illustrated by original drawings and specimens of the insect and its ravages.

The *Pine Beetle*, the *Fir Weevil*, the *Black Arch Nuisance* (or *Spruce Moth*), and the *Elm-bark Beetle* are excluded, having been already reported on.

CLASS II.

DISTRICT COMPETITIONS.

REGULATIONS 1896.

The Money Premiums and Medals awarded at District Competitions will be sent direct to the winners in January next. No payments must therefore be made by the Secretary or Treasurer of any local Association.

Grants in aid of DISTRICT COMPETITIONS for 1897 must be applied for before 1st November 1896, on Forms to be obtained from the Secretary.

When a Grant has expired, the District cannot apply again for aid for two years.

SECTION I.—GRANTS TO DISTRICT SOCIETIES FOR HORSES, CATTLE, SHEEP, AND PIGS.

1. CLASS OF STOCK—LIMIT OF GRANTS, £340.—The Highland and Agricultural Society will make Grants to District Societies to deal with, as in the opinion of the District Societies the need of each district may require, for such classes of breeding Stock of Horses, Cattle, Sheep, and Pigs as are embraced in the General Show Prize List of the Highland and Agricultural Society. The total sum to be expended by the Highland and Agricultural Society in such Grants shall not exceed the sum of £340 in any one year.

2. GRANT TO DISTRICT, £12.—The portion of the Grant to any one District Society shall not exceed the sum of £12 in any one year.

3. CONTINUANCE OF GRANT THREE YEARS—ADVERTISING.—The Grant shall continue for three alternate years, provided always that the District Society shall, in the two intermediate years, continue the competition by offering Premiums equal in amount to not less than one-half the sum given by the Highland and Agricultural Society, and for the same class of Stock as that selected in each previous year to compete for the Highland and Agricultural Society's Prizes. The Prizes when given by the Highland and Agricultural Society must be announced as the Society's gift. If no competition takes place for two years the Grant expires.

4. When it is agreed to hold the General Show of the Society in any district, no provincial show shall be held in that district in the months of June, July, or August.

5. MEDALS.—In the two alternate years the Highland and Agricultural Society will place three Bronze Medals at the disposal of the District Societies, for the same classes of Stock as those for which the Money Premiums are offered, provided that not less than three lots are exhibited in the same class.

6. RULES OF COMPETITION.—The Rules of Competition for the Premiums, the Funds for which are derived from Grants of the Highland and Agricultural Society, shall be such as are generally enforced by the Society receiving the Grant for Premiums offered by itself.

7. AREA AND PARISHES—FIVE PARISHES.—When making application for Grants from the Highland and Agricultural Society, the District Society must delineate the area and the number of parishes comprised in the district, and *except in special cases*, no District Society shall be entitled to a Grant whose show is not open to at least *five* Parishes.

8. NOMINATION OF MEMBERS.—The Directors may nominate one or more members of the Highland and Agricultural Society resident in the district, whose duty it shall be to see that the conditions imposed by the Board are complied with.

9. REPORTS.—Blank Reports will be furnished to the Secretaries of the different District Societies. These Reports must in all details be completed and lodged with the Secretary of the Highland and Agricultural Society on or before the 1st of November next following the competition, both in the years when the Grant is given and in the two intermediate years, for the approval of the Directors of the Highland and Agricultural Society, against whose decision there shall be no appeal. All such Reports must be signed and certified by the Members of the Highland and Agricultural Society nominated under Rule 8.

10. GRANTS—WHEN PAID.—The Grants made to District Societies will be paid in the January following the competition, by Precepts issued by the Directors of the Highland and Agricultural Society to the winners of the prizes. No payments of these Grants must be made by the Secretary or Treasurer of any District Society. Medals will be issued at the same time.

11. RENEWAL OF APPLICATION.—No application for renewal of a Grant to a District Society will be entertained until the expiration of *two years* from the termination of the last Grant.

12. DISPOSAL OF APPLICATIONS.—In disposing of applications for District Grants, the Directors of the Highland and Agricultural Society shall keep in view the length of interval that has elapsed since the expiration of the last Grant, giving priority to those District Societies which have been longest off the list.

13. DAIRY PRODUCE.—Upon application being made by District Societies, a limited number of Medals will be placed at the disposal of District Societies for Dairy Produce.

DISTRICTS.

1. ARGYLL.—*Convener*, Dr D. M'Millan, Tarbert; *Secretary*, Hugh Mundell, Tarbert. Granted 1894.
2. CARRICK.—*Convener*, Alexander Cross of Knockdon, 19 Hope Street, Glasgow; *Secretary*, David Brown, Solicitor, Maybole. Granted 1894.
3. MORAYSHIRE.—*Convener*, James Brander, Pittendreich, Elgin; *Secretary*, James Black of Sheriffston, Elgin. Granted 1894.
4. FORTH.—*Convener and Secretary*, Thomas Nimmo, Lawhead, Forth, Lanark. Granted 1894.
5. BUCHAN.—*Convener*, William Ainslie, Parkwell, Mintlaw; *Secretary*, James Smith, Burnshangie, Strichen. Granted 1896.
6. ROYAL NORTHERN.—*Convener*, George J. Walker, Portlethen, Aberdeen; *Secretary*, George Bruce, 35 Market Street, Aberdeen. Granted 1896.
7. MID-ANNANDALE.—*Convener*, James Lindsay, Whitecastles, Lockerbie; *Secretary*, John A. Mackenzie, Solicitor, Lockerbie. Granted 1896.
8. CENTRAL BANFFSHIRE.—*Convener*, John M'Pherson, Mulben, Keith; *Secretary*, George Donald, Ladyhill, Grange, Keith. Granted 1893.

9. STRATHSPEY.—*Convener*, John Smith, Inverallan House, Grantown ; *Secretary*, D. G. Lawson, Auchnagallen, Grantown. Granted 1893.
10. WEST LINTON.—*Convener*, George Forrest, Edston, Peebles ; *Secretary*, F. W. Dyson, 6 Haystoun Place, Peebles. Granted 1893.
11. ISLAY, JURA, AND COLONSAY.—*Convener*, ; *Secretary*, Robert Cullen, Bridgend, Islay. Granted 1893.
12. WEST TEVIOTDALE.—*Convener and Secretary*, James Oliver, Thornwood, Hawick. Granted 1893.
13. KINCARDINESHIRE.—*Convener*, John Hart, Cowie Mains, Stonehaven ; *Secretary*, A. B. Annandale, Stonehaven. Granted 1892. (In abeyance in 1894.)
14. ABERDOUR.—*Convener*, Alex. Lovie, Nether Boyndlie, Fraserburgh ; *Secretary*, William Chapman, Woodhead, Aberdour, Fraserburgh. Granted 1895.
15. VALE OF ALFORD.—*Convener*, George Wilken, Waterside of Forbes, Alford, N.B. ; *Secretary*, John Reid, Cairnballoch, Alford, N.B. Granted 1895.
16. CAITHNESS.—*Convener*, E. W. Horne of Stirkoke, Wick ; *Secretaries*, Paterson Smith, Wick, and George Brown, Watten Mains, Wick. Granted 1895.
17. DALKEITH.—*Convener*, Thomas M. Skirving, Niddrie Mains, Liberton ; *Secretary*, John Dobbie, Campend, Dalkeith. Granted 1895.
18. BLACK ISLE.—*Convener*, R. Trotter, Garguston, Muir of Ord ; *Secretary*, Thomas Henderson, Fortrose. Granted 1895.
19. KINGLASSIE.—*Convener and Secretary*, James Inglis, Redhouse, Cardenden. Granted 1894.
20. WEEM.—*Convener*, Robert Menzies, Tirinie, Aberfeldy ; *Secretary*, Hugh Campbell, Camserney Cottage, Aberfeldy. Granted 1894.

In 1896.

Nos. 1, 2, 3, and 4, are in competition for the second year.

Nos. 5, 6, and 7, are in competition for the first year.

Nos. 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, and 18, compete for local Premiums.

Nos. 19 and 20 are in abeyance on account of the Perth Show.

SECTION 2.—GRANTS TO HORSE ASSOCIATIONS, &c., FOR STALLIONS FOR AGRICULTURAL PURPOSES.

1. HORSES—LIMIT OF GRANT, £210.—The Highland and Agricultural Society will make Grants to Horse Associations and other Societies in different districts engaging Stallions for agricultural purposes. The total sum expended by the Highland and Agricultural Society in such Grants shall not exceed the sum of £210 in any one year.

2. GRANT TO EACH, £15.—The portion of the Grant to any one Horse Association, &c., shall not exceed the sum of £15 in any one year.

3. CONTINUANCE OF GRANT THREE YEARS—INTERMEDIATE YEAR.—The Grant shall continue for three alternate years, provided always that the Horse Association or Society shall, in the two intermediate years, offer at least a sum equal in amount to that granted by the Highland and Agricultural Society for the hire of a Horse in connection with the Association or Society to whom the Grant is made.

4. NOMINATION OF MEMBERS.—The Directors of the Highland and Agricultural Society shall nominate one or more members of the Highland and

Agricultural Society, resident in the Districts in which the Society benefited is located, whose duty it shall be to see that the conditions imposed by the Board are complied with.

5. REPORTS—PENALTY FOR NOT ENGAGING HORSE.—No Grant by the Highland and Agricultural Society to Horse Associations, &c., will be paid unless a report, signed and certified by the members appointed under Rule 4, be furnished to the Highland and Agricultural Society not later than the 1st of November in each year in which the Grant is made, and also in the alternate years, stating that a Horse has been engaged by the Horse Association or other Society to whom the Grant is made; and in the event of a Horse not being engaged in any one year while the provisions of the Grant are in force, the Grant made by the Highland and Agricultural Society will cease.

6. RULES 10 (Time of Payment), 11 (Renewal of Grant), and 12 (Disposal of Applications) applicable to Section 1, shall be applicable to Section 2.

DISTRICTS.

1. INVERNESS FARMERS' SOCIETY.—*Convener*, Duncan Forbes of Culloden, Inverness; *Secretary*, William M'Bean, Cradlehall, Inverness. Granted 1893. (In abeyance in 1895.)
2. LOWER WARD OF RENFREWSHIRE STALLION SOCIETY.—*Convener*, R. Sinclair Scott, Burnside, Largs; *Secretary*, R. Steuart Walker, 12 William Street, Greenock. Granted 1893. (In abeyance in 1895.)
3. LAUDERDALE.—*Convener*, R. Dickinson, Longcroft, Lauder; *Secretary*, George L. Broomfield, Lauder. Granted 1894.
4. NORTHERN DISTRICT OF KINCARDINESHIRE HORSE SOCIETY.—*Convener*, John Hart, Mains of Cowie, Stonehaven; *Secretary*, A. B. Annandale, Stonehaven. Granted 1894.
5. ORKNEY HORSE-BREEDING SOCIETY.—*Convener*, James Drever, Swanney, Finstown, Orkney; *Secretary*, Robert Scarth, Binscarth, Finstown, Orkney. Granted 1894.
6. STRATHEARN CENTRAL.—*Convener and Secretary*, Robert Gardiner, Henhill, Forteviot. Granted 1894.
7. WESTERN DISTRICT OF MID-LOTHIAN.—*Convener*, James Paterson of Bankton, Mid-Calder; *Secretary*, John T. Mungle, Commercial Bank of Scotland, West Calder. Granted 1896.
8. STIRLING DISTRICT HORSE SOCIETY.—*Convener*, Peter Dewar, King's Park, Stirling; *Secretary*, Robert Paterson, Hill of Drip, Stirling. Granted 1896.
9. SPEYSIDE CLYDESDALE HORSE-BREEDING ASSOCIATION.—*Convener*, Col. John Gordon Smith of Delnabo, Glenlivet, Ballindalloch; *Secretary*, A. R. Stuart of Inverfiddich, Craigellachie. Granted 1893.
10. TURRIFF CLYDESDALE HORSE SOCIETY.—*Convener*, William Paterson, Auldtown of Carnousie, Turriff; *Secretary*, R. Cruickshank, Claymires, Turriff. Granted 1895.
11. KELSO DISTRICT CLYDESDALE HORSE SOCIETY.—*Convener*, W. G. Hogarth, Linton Bankhead, Kelso; *Secretary*, Adam Liddell, 3 Square, Kelso. Granted 1895.

In 1896.

Nos. 1, 2, 3, 4, 5, and 6 are in competition for the second year.

Nos. 7 and 8 are in competition for the first year.

Nos. 9, 10, and 11 compete for local premiums.

DAIRY PRODUCE.

Upon application being made by District Societies, a limited number of Bronze Medals will be placed at the disposal of District Societies for Dairy Produce.

SPECIAL GRANTS.

- £40 to the Highland Home Industries Association. — *Secretary*, Miss Muriel K. Mackenzie, Conon House, Conon Bridge, Ross-shire.
- £20 to the Ayrshire Agricultural Association, to be competed for at the Dairy Produce Show at Kilmarnock. — *Convener*, The Hon. G. R. Vernon, Auchans House, Kilmarnock; *Secretary*, James M'Murtrie, Ayr. Granted 1872.
- £5 to Shetland Agricultural Society. — *Convener*, John Bruce of Sumburgh, Lerwick; *Secretary*, Archibald J. Garrioch, Lerwick. Granted 1893.
- £3 to Orkney. — *Secretary*, James Johnston, Orphir House, Orkney. Granted 1883.
- £3 to South Uist and Barra. — *Convener and Secretary*, Donald Paterson, Askernish, South Uist, Oban. Granted 1890. (In abeyance in 1892, 1893, 1894, and 1895.)
- £3 to North Uist. — *Convener*, Sir John Campbell Orde, Bart.; *Secretary*, James M. Fraser, Banker, Lochmaddy. Granted 1890. (In abeyance in 1894 and 1895.)

MEDALS IN AID OF PREMIUMS GIVEN BY LOCAL SOCIETIES.

The Society, being anxious to co-operate with local Associations, will give a limited number of Bronze Medals annually to Societies, not on the list of Cattle, Horse, or Sheep Premiums, in addition to the Money Premiums awarded in the Districts for—

1. Best Bull, Cow, Heifer of any pure breed, or Ox.
2. Best Stallion, Mare, or Gelding.
3. Best Tup, or Pen of Ewes or Wethers.
4. Best Boar, Sow, or Pig.
5. Best Pens of Poultry.
6. Best Sample of any variety of Wool.
7. Best Sample of any variety of Seed.
8. Best managed Farm.
9. Best managed Green Crop.
10. Best managed Hay Crop.
11. Best managed Dairy.
12. Best Sweet-Milk Cheese.
13. Best Cured Butter.
14. Best sample of Honey, not less than 5 lb., taken without destroying the bees.
15. Best collection of Roots.
16. Best kept Fences.
17. Male Farm Servant who has been longest in the same service, and who has proved himself most efficient in his duties, and to have invariably treated the animals under his charge with kindness.

18. Female Servant in charge of Dairy and Poultry who has been longest in the same service, and who has proved herself most efficient in her duties, and to have invariably treated the animals under her charge with kindness.
19. Best Sheep-Shearer.
20. Most expert Hedge-Cutter.
21. Most expert Labourer at Draining.
22. Most expert Farm Servant at trial of Reaping-Machines.
23. Best Maker of Oat-Cakes.

It is left to the local Society to choose out of the foregoing list the classes for which the Medals are to be competed.

The Medals are granted for two years, and lapse if not awarded in those years.

In 1889 it was resolved that in future no Society shall receive more than two Medals for two years.

Aberdeenshire.

1. AUCHINDOIR, KILDUMMY, AND TOWIE.—*Convener*, James Macdonald, Mossat, Kildrummy; *Secretary*, James Watt, Muirs, Kildrummy. 2 Medals. 1896.
2. CLUNY, MONYMUSE, AND MIDMAR.—*Convener*, Ranald Macdonald, Cluny Castle, Aberdeen; *Secretary*, James Christie, Backhill of Castle Fraser, Kemnay. 2 Medals. 1895.
3. CROMAR, UPPER DEE, AND DONSIDER.—*Convener*, Sir John F. Clark of Tillyprouie, Bart., Tarland; *Secretary*, William Thomson, Banker, Tarland. 2 Medals. 1896.

Argyllshire.

4. POLTALLOCH.—*Convener*, Colonel Malcolm of Poltalloch, C.B., Lochgilphead; *Secretary*, Archd. Taylor, Killinnochinch, Lochgilphead. 2 Medals. 1896.

Ayrshire.

5. DALRYMPLE.—*Convener*, Alex. Calderwood, Perclewan, Dalrymple; *Secretary*, John Murchie, Netherton, Dalrymple. 2 Medals. 1895.
6. IRVINE.—*Convener*, David Stevenson, Auchengate, Troon; *Secretaries*, James G. Parker, Marress, Irvine; and John Blane, British Linen Company Bank, Irvine. 2 Medals. 1895.
7. STEWARTON.—*Convener and Secretary*, John Lindsay, Temple House, Stewarton. 2 Medals. 1896.

Berwickshire.

8. BERWICKSHIRE BEE-KEEPERS.—*Convener*, Frank Muirhead, Paxton, Berwick-on-Tweed; *Secretary*, Robert Greig, Auchencrow, Reston. 2 Medals. 1896.
9. LAUDERDALE ORNITHOLOGICAL.—*Convener*, Geo. Beveridge, Waterloo, Lauder; *Secretary*, George Westwood, Lauder. 2 Medals. 1895.

Clackmannanshire.

10. CLACKMANNANSHIRE UNION.—*Convener*, William Alexander, Loanside, Clackmannan; *Secretary*, Alexander Norval, Solicitor, Alloa. 2 Medals. 1896.

Dumfriesshire.

11. SANQUHAR.—*Convener*, James Moffat, Gateside, Sanquhar; *Secretary*, William Murray, British Linen Company Bank, Sanquhar. 2 Medals. 1896.
12. SOUTH OF SCOTLAND BEE-KEEPERS.—*Convener*, Thomas Kennedy Newbigging, Stewart Hall, Dumfries; *Secretary*, 2 Medals. 1895.

Fifeshire.

13. WESTERN DISTRICT OF FIFE.—*Convener*, John Stevenson, Lilliehill, Dunfermline; *Secretary*, Robert Husband, Solicitor, Dunfermline. 2 Medals. 1895.

Haddingtonshire.

14. UNITED EAST LOTHIAN.—*Convener*, Charles Smith, Whittinghame, Prestonkirk; *Secretary*, John Stirling, Solicitor, Haddington. 2 Medals. 1895.

Inverness-shire.

15. GLEN URQUHART.—*Convener and Secretary*, Major W. Grant, Seafiel Estates Office, Glen Urquhart, Inverness. 2 Medals. 1896.

Kincardineshire.

16. FETTERCAIRN.—*Convener*, Colonel M^cInroy of The Burn, Edzell; *Secretary*, William Crichton, Castleton of Kincardine, Laurencekirk. 2 Medals. 1896.

Lanarkshire.

17. CARMICHAEL.—*Convener*, Sir W. C. J. C. Anstruther, Bart., Carmichael House, Thankerton; *Secretary*, William Adamson, Devon-side, Thankerton. 2 Medals. 1895.

Stirlingshire.

18. CAMPSIE, STRATHBLANE, AND BALDERNOCK.—*Convener*, R. M^cIndoe, Knowehead, Campsie Glen; *Secretary*, James N. Paul, Ibert, Killearn. 2 Medals. 1895. (In abeyance in 1895.)
19. SLAMANNAN.—*Convener*, James M^cKillop, Polmont Park, Polmont; *Secretary*, Matthew Dunlop, North End, Slamannan. 2 Medals. 1895.

Applications from other Districts must be lodged with the Secretary of the Society by 1st November next.

RULES OF COMPETITION.

1. All Competitions must be at the instance of a local Society.
2. The classes for which Medals are granted must be in accordance with the list at page 50. The Committee shall select the classes, and specify them in the return.
3. A Committee of Management shall be appointed, and the Convener of the Committee must be a Member of the Highland and Agricultural Society.
4. The Money Premiums given in the District must be not less than £2 for each Medal claimed.
5. The Medal for Sheep-Shearing shall not be awarded unless there are three competitors, and it shall always accompany the highest Money Premium. There must not be fewer than two competitors in all the classes.
6. Blank reports will be furnished to all the Conveners and Secretaries of the different Districts. These must, in all details, be completed and lodged with the Secretary *on or before the 1st of November next*, with the exception of green crop reports, which must be forwarded on or before the 20th of December, for the approval of the Directors, against whose decisions there shall be no appeal.
7. When a grant has expired, the District shall not be eligible to apply again for aid for two years; and if no competition takes place in a District for two years, the grant shall expire.

PLOUGHING COMPETITIONS.

The Minor Silver Medal will be given to the winner of the first or highest Premium at Ploughing Competitions, provided a Report in the following terms is made to the Secretary, within one month of the Competition, by a Member of the Society:—

FORM OF REPORT.

I, _____ of _____, Member of the Highland and Agricultural Society, hereby certify that I attended the Ploughing Match of the _____ Association at _____ in the county of _____ on the _____ when _____ ploughs competed; _____ of land were assigned to each, and _____ hours were allowed for the execution of the work. The sum of £ _____ was awarded in the following proportions, viz. :—

[*Here enumerate the names and designations of successful Competitors.*]

RULES OF COMPETITION.

1. All Matches must be at the instance of a local Society or Ploughing Association, and no Match at the instance of an individual, or confined to the tenants of one estate, will be recognised.
2. The title of such Society or Association, together with the name and address of the Secretary, must be registered with the Secretary of the Highland and Agricultural Society, 3 George IV. Bridge, Edinburgh.
3. Not more than one Match in the same season can take place within the bounds of the same Society or Association.

4. All reports must be lodged within one month of the date of the Match, and certified by a Member of the Highland and Agricultural Society who was present at it.

5. A Member can only report one Match; and a Ploughman cannot carry more than three Medals in the same season.

6. To warrant the grant of the Medal there must have been twelve ploughs in Competition, and Three Pounds awarded in Premiums by the local Society. The Medal to be given to the winner of the first or highest prize.

7. Ploughmen shall not be allowed any assistance, and their work must not be set up nor touched by others; on land of average tenacity the ploughing should be at the rate of an imperial acre in ten hours, and attention should be given to the firmness and sufficiency of the work below more than to its neatness above the surface.

CLASS III.

COTTAGES AND GARDENS.

The following Premiums are offered for Competition in the Parishes after mentioned.

The Premiums are granted for two years.

PREMIUMS FOR BEST KEPT COTTAGES AND GARDENS.

| | | | | | | | | |
|-----------------------------|---|---|---|---|---|----|----|---|
| 1. Best kept Cottage | . | . | . | . | . | £1 | 0 | 0 |
| Second best | . | . | . | . | . | 0 | 10 | 0 |
| 2. Best kept Cottage Garden | . | . | . | . | . | 1 | 0 | 0 |
| Second best | . | . | . | . | . | 0 | 10 | 0 |

RULES OF COMPETITION.

1. Competitions may take place in the different parishes for Cottages and Gardens, or for either separately.

2. The occupiers of Lodges at Gentlemen's Approach Gates and Gardeners' Houses are excluded, as well as others whom the Committee consider, from their position, not to be entitled to compete. The inspection must be completed by the 1st of October. In making the inspection, the Conveners may take the assistance of any competent judges.

3. It is left to the Committee of the District to regulate the maximum annual rent of the Cottages, which may, with the garden, be from £5 to £7.

4. To warrant the award of full Premiums, there must not be fewer than three competitors in each class. If there are less than three competitors in each class, only half Premium will be awarded.

5. A person who has gained the highest Premium cannot compete again.

6. If the Cottage is occupied by the proprietor, the roof must be in good repair; if the roof is thatch, it must be in good repair, though in the occupation of a tenant. The interior and external conveniences must be clean and orderly; the windows must be free of broken glass, clean, and affording the means of ventilation. Dunghills, and all other nuisances, must be removed from the front and gables. In awarding the Cottage Premiums,

preference will be given to Competitors who, in addition to the above requisites, have displayed the greatest taste in ornamenting the exterior of their houses, and the ground in front and at the gables.

7. In estimating the claims for the Garden Premiums, the judges should have in view—the sufficiency and neatness of the fences and walks; the cleanness of the ground; the quality and choice of the crops; and the general productiveness of the garden.

8. Reports, stating the number of Competitors, the names of successful parties, and the nature of the exertions which have been made by them, must be transmitted by the Conveners to the Secretary *on or before the 1st November next*.

9. When a grant has expired, the District cannot apply again for aid for two years.

Parishes desirous of these Premiums must lodge applications with the Secretary *on or before the 1st November next*.

MEDALS FOR COTTAGES AND GARDENS OR GARDEN PRODUCE.

The Society will issue annually two Minor Silver Medals to a limited number of local Associations or individuals, who at their own expense establish Premiums for Cottages and Gardens under £15 of Rent. One of the Medals may be awarded for best kept Cottage, and the other for the best kept Garden or Flower Plot, or Garden Produce, the produce of the cottager's own garden.

Local Associations or individuals desirous of these Medals, must lodge applications with the Secretary *on or before the 1st November next*.

The Medals are granted for two years.

Aberdeenshire.

1. DRUMBLADE.—*Convener*, George A. Ferguson, Lessendrum, Huntly
Secretary, Alex. Simpson, Slioch, Huntly. 2 Medals. 1895.

Ayrshire.

2. DARVEL.—*Convener*, James Armour, Glaister, Darvel; *Secretary*, Matthew Mair, Auchinbart, Newmilns. 2 Medals. 1895.

Dumbartonshire.

3. OLD KILPATRICK.—*Convener*, William Stewart, Milton, Duntocher; *Secretary*, David Watson, Co-operative Buildings, Dalmuir. 2 Medals. 1896.

Fifeshire.

4. DYSART.—*Convener*, James Allan, Dysart; *Secretary*, Peter Buist, 14 Alexander Street, Dysart. 2 Medals. 1895.
5. KINGSKETTLE.—*Convener*, William Dingwall, Ramornie, Ladybank; *Secretary*, David Beveridge, Kettle. 2 Medals. 1895.

Haddingtonshire.

6. PENCAITLAND.—*Convener*, William Stodart, Wintonhill, Tranent; *Secretary*, Peter Cossar, Pencaitland. 2 Medals. 1895.

Inverness-shire.

7. ERCHLESS.—*Convener*, J. B. Grant, Erchless, Beauly; *Secretary*, A. MacIntosh, Gardener, Erchless, Beauly. 2 Medals. 1896.

Kincardineshire.

8. FORDOUN.—*Convener*, James Smith, Pittengardner, Fordoun; *Secretary*, John Cadenhead, Lutherbank, Auchinblae. 2 Medals. 1896.

Kirkcudbrightshire.

9. KIRKPATRICK-DURHAM.—*Convener*, James M'Queen of Crofts, Dalbeattie; *Secretary*, David C. G. Johnston, Kirkpatrick-Durham, Dalbeattie. 2 Medals. 1895.

Lanarkshire.

10. CAMBUSLANG.—*Convener*, John Speir, Newton Farm, Newton, Glasgow; *Secretaries*, H. & J. M. Aitchison, Rosebank Buildings, Cambuslang. 2 Medals. 1896.
11. MIDDLE WARD OF LANARKSHIRE FLORAL.—*Convener*, Robert Jack, Banker, Motherwell; *Secretary*, George Bowman, Gilmour Crescent, Calder Street, Motherwell. 2 Medals. 1896.

Nairnshire.

12. AULDEARN AND ARDCLACH.—*Convener*,
; *Secretaries*, A. J. Mackintosh, Auldearn, and F. Duff, Kinsteary, Auldearn. 2 Medals. 1896.
13. NAIRNSHIRE.—*Convener*, Robert Anderson of Lochdhu, Nairn; *Secretary*, J. M'Intosh, Nairn. 2 Medals. 1895.

Perthshire.

14. ALMOND VALLEY.—*Convener*, J. D. Lumsden, Huntingtowerfield, Perth; *Secretary*, James Anderson, jun., Huntingtowerfield, Perth. 2 Medals. 1895.
15. BLAIRGOWRIE AND RATTRAY.—*Convener*, John Panton of Dalnagairn, Blairgowrie; *Secretary*, John Kidd, 14 Newton Street, Blairgowrie. 2 Medals. 1896.
16. DUNNING.—*Convener*, Robert Gardiner, Henhill, Forteviot; *Secretary*, Johnstone Wright, Dunning. 2 Medals. 1895.
17. MEIGLE.—*Convener*, John Yeaman, Royal Bank, Alyth; *Secretary*, James Armitt, Crathie House, Meigle. 2 Medals. 1895.

Renfrewshire.

18. BRIDGE OF WEIR.—*Convener*, A. M. Brown, Gryffe Castle, Bridge of Weir; *Secretary*, William Mason, Bridge of Weir. 2 Medals. 1895.

Ross-shire.

19. LOCHBROOM.—*Convener*, J. A. Fowler, yr. of Braemore, Inverbroom House, Garve; *Secretary*, Hay Mackenzie, Bank Agent, Ullapool. 2 Medals. 1896.

Stirlingshire.

20. MILTON.—*Convener*, Charles M. King, Antermony House, Milton of Campsie ; *Secretary*, John Gillespie, Craighead, Milton of Campsie. 2 Medals. 1896.
21. POLMONT.—*Convener*, David Mitchell of Millfield, Polmont ; *Secretary*, David Pollock, Gardenhead, Polmont. 2 Medals. 1896.

REGULATIONS.

1. Competitions may take place in the different districts for Cottages and Gardens, or for either separately. The one Medal may be offered for Cottages, and the other for Gardens or Garden Produce, but the two cannot be given in one class.

2. The annual value of each Cottage, with the ground occupied in the parish by a Competitor, must not exceed £15. The occupiers of Lodges at Gentlemen's Approach Gates, and Gardeners in the employment of others, are not entitled to compete.

3. If Competition takes place for Garden Produce in place of the best kept Garden, such produce must be *bona fide* grown in the Exhibitor's Garden, and he will not be allowed to make up a collection from any other Garden.

4. To warrant the award of a Medal, there must not be fewer than three Competitors.

5. Blank reports will be furnished to the Conveners and Secretaries of the different Districts. These must, in all details, be completed and lodged with the Secretary *on or before the 1st November next*, for the approval of the Directors, against whose decisions there shall be no appeal.

6. When a grant has expired, the District cannot apply again for aid for two years, and if no competition takes place in a District for two years the grant expires.

Subject to Orders issued by the Board of Agriculture

HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND

GENERAL SHOW OF STOCK AND IMPLEMENTS

ON

THE SOUTH INCH PERTH

ON 21ST, 22D, 23D, AND 24TH JULY 1896.

LAST DAYS OF ENTRY.

IMPLEMENTS AND OTHER ARTICLES—Monday, 18th May.

STOCK, POULTRY, AND DAIRY PRODUCE—Monday, 15th June.

No Entry at ordinary fees taken later than those which are received at the Society's Office, Edinburgh, by first post, or 10 o'clock, on Monday morning (15th June). Post Entries for Cattle, Horses, Sheep, and Swine taken on payment of 10s. additional for each entry (Poultry at double fees) till Wednesday morning (17th June), at the Society's Office, Edinburgh, at 10 o'clock.

COVERED BOOTHS FOR OFFICES—Monday, 15th June.

President of the Society.

THE MARQUIS OF BREADALBANE, K.G.

Chairman of the Board of Directors.

REV. JOHN GILLESPIE.

Convenor of the Local Committee.

LORD BALVAIRD, SCONE PALACE, PERTH.

The District connected with the Show comprises the Counties of Perth (Eastern Division), Forfar (Western Division), Fife and Kinross.

REGULATIONS.

GENERAL CONDITIONS.

1. The Competition, except where otherwise stated, is open to Exhibitors from all parts of the United Kingdom.
2. Every Lot must be intimated by a Certificate of Entry, lodged with the Secretary *not later than Monday, 18th May, for Implements and other*

Articles, and Monday, 15th June, for Stock, Poultry, and Dairy Produce.
No Entry taken at ordinary fees later than those which are received at the Society's Office by first post, or 10 o'clock, on Monday morning, 15th June. Post Entries for Cattle, Horses, Sheep, and Swine taken on payment of 10s. additional for each entry (Poultry at double fees) till Wednesday morning (17th June), at the Society's Office, Edinburgh, at 10 o'clock. Printed forms of Entry will be issued on application to the Secretary, No. 3 George IV. Bridge, Edinburgh. Admission Orders will be forwarded to Exhibitors, by post, previous to the Show.

Protests. 3. Protests against the awards of the Judges, or against a violation of the judging regulations, must be lodged with the Secretary, at his Office in the Showyard, not later than 9 A.M. on Wednesday, the second day of the Show, and parties must be in attendance at the Committee Room, in the Showyard, at 9.30 A.M. that day, when protests will be disposed of. All protests must be accompanied by a deposit of £2, 2s., and if not sustained the sum may be forfeited at the discretion of the Directors.

4. Protests lodged for causes which the protester produces no good evidence to substantiate will render him liable to be reported to the Board of Directors, with the view, if they see reason, of his being prohibited from again entering Stock for a General Show.

Society not liable. 5. The Society shall not be liable for any loss or damage which Stock, Poultry, Dairy Produce, Implements, or other articles may sustain at the Show, or in transit.

Decisions of Board. 6. The decisions of the Board of Directors are final in all questions respecting Premiums and all other matters connected with the Show, and it shall not be competent for any Exhibitor to appeal against such decisions to, nor seek redress in respect of them from, any other tribunal.

Covered Booths. 7. Covered Booths for Offices (9 feet by 9 feet), purely for business, not for exhibition of goods, can be had for £3, 10s. to Members and £5 to Non-Members. Intimation to be made to the Secretary on or before the 15th of June. Those applying after that date to pay double Entry Money, but no application can be received later than 3d July.

Lights and Smoking. 8. No lights allowed in the Yard at night, and Smoking is strictly prohibited within the Sheds. Those infringing this Rule shall be liable to a fine of 10s.

Water. 9. As the command of water in the Yard is limited, it is particularly requested that waste be avoided.

Restoring Turf. 10. When the ground requires to be broken, the turf must be carefully lifted and laid aside, and the surface must be restored to the satisfaction of the Society, and at the expense of the Exhibitor.

Subjection to Rules. 11. All persons admitted into the Showyard shall be subject to the Rules and Orders of the Directors.

Powers of Stewards. 12. The Stewards have power to enforce the Regulations of the Society in their different departments, and to bring to the notice of the Directors and Secretary any infringement thereof.

Attendants. 13. All persons in charge of Stock or other Exhibits shall be subject to the orders of the Secretary and Stewards.

Violation of Rules. 14. The violation by an Exhibitor of any one of the Regulations shall render him liable to the forfeiture of all Premiums awarded to him, or of such a portion as the Directors may ordain.

Railway Passes. 15. Railway Passes for Stock and Implements are issued to Exhibitors before the Show along with their Tickets of Admission.

Removal of Exhibits. 16. No animal or article can be withdrawn before the formal closing of the Show at 5 P.M. on Friday; Steam Engines not till 6 o'clock. Stock and Implements may remain in the Yard till Saturday afternoon.

Payment of Prizes. 17. The Premiums awarded, except those withheld till birth of calf or

foal is certified, will be paid in the November following the Show, and, with the exception of the Tweeddale Gold Medal, Special Challenge Cups, and the Silver Medals, may be taken either in money or in plate.

STOCK AND POULTRY.

18. Poultry and Stock will be admitted on Monday, the day before the opening of the Show, and, with the exception of Horses, must be in the Yard before 12 o'clock that night. Horses must be in before 8 o'clock on the morning of Tuesday, except those entered for Jumping only, regarding which special Regulations will be found beside the list of prizes for Jumping. Judging begins at 10 A.M. on Tuesday. Exhibited on Tuesday, Wednesday, Thursday, and Friday. Stock may be admitted on the Saturday preceding the Show, but only by sending two days' prior notice to the Secretary. *Admission of Stock.*

19. An animal which has gained a first Premium at a General Show of the Society cannot again compete in the same class, but may be exhibited as Extra Stock. *Former Winners.*

20. All animals, except calves, foals, and lambs shown with their dams, must be entered in the classes applicable to their ages, and cannot be withdrawn after entry, or other animals be substituted in their place. *No substitution of animals.*

21. For prizes given by the Society, no animal shall be allowed to compete in more than one class; but this Rule does not apply to the Jumping and Driving Competitions. *One class only.*

22. Shorthorn, Aberdeen-Angus, Galloway, and West Highland animals must be entered in the herd-books, or the Exhibitor must produce evidence that his animal is eligible to be entered therein. *Herd-books.*

23. Stock must be *bona fide the property of* the Exhibitor on the last day of Entry. *Ownership.*

24. The Schedule of Entry must be filled up so far as within the knowledge of the Exhibitor. The Society shall have power at any time to call upon an Exhibitor to furnish proof of the correctness of any statement in his entry.

25. The name of the Breeder, if known, must be given, and if the Breeder is not known, a declaration to that effect, signed by the Exhibitor, must be sent along with the Schedule, and no pedigree will be entered in the Catalogue when the Breeder is unknown. *Particulars of entries.*

26. Should it be proved to the satisfaction of the Directors that an animal has been entered under a false name, pedigree, or description, for the purpose of misleading the Directors or Judges as to its qualification or properties, or that information required in the Schedule and known or easily ascertained by the Exhibitor has been withheld, such animal may be disqualified either before or after a prize has been awarded to it, and the case may be reported to the Directors, in order that the Exhibitor may be disqualified from again competing at the Society's Shows, or his case otherwise disposed of as the Directors may determine. *Entries disqualified.*

27. When an animal has previously been disqualified by the decision of any Agricultural Association in the United Kingdom, such disqualification shall attach, if the Exhibitor, being aware of the disqualification, fail to state it, and the grounds thereof, in his entry, to enable the Directors to judge of its validity. Any person who is disqualified from exhibiting at any Show in the United Kingdom shall be prohibited from exhibiting at any General Show of the Society, unless with the special consent of the Board.

28. All Horses or Ponies entered in classes in which a particular height is stated shall before being judged be measured with their shoes on. No subsequent measuring or alteration of shoes will be permitted. *Height of Horses.*

- Overfeeding.* 29. Breeding Stock must not be shown in an improper state of fatness, and the Judges are requested not to award Premiums to overfed animals; and no Cattle or Sheep which have been exhibited as Fat Stock at any Show are eligible to compete in the Breeding Classes for the Society's Prizes.
- Parades.* 30. Horses and Cattle must be paraded at the times stated in the Programme of the Show, and when required by the Stewards, and under their direction. Prize and commended animals will receive two rosettes each, which must be attached to the head of the animal, one on each side. Attendants must be beside their animals *twenty minutes before the hour of Parade*, and be ready to proceed to the ring immediately on receiving the order of the Stewards. Infringement of this Rule, or failure of any attendant to obey the orders of the Society's officials, will render the Exhibitor liable to a fine of 20s., and to the forfeiture of any or all of the Prizes awarded to him at this Show.
- Responsibility of Exhibitors.* 31. Exhibitors shall be answerable for all acts, whether committed by themselves, their servants, or others in charge of their Stock, and shall be responsible for the condition of their animals during the whole time they remain in the Showyard.
- Authority for removal.* 32. No animal shall be taken out of its stall after 10 A.M. during the Show except by order of the Stewards, or with permission of the Secretary. Those infringing this Rule shall be liable to a fine of 10s.
- Sires.* 33. Aged Bulls and Stallions must have had produce, and, along with two-year-old Bulls, three-year-old Colts, and two-shear and aged Tups, have served within the year of the Show.
- Cows.* 34. All Cows must have had calves previous to the Show, and when exhibited they must either be in milk or in calf: if in milk, birth must have been within 9 months of the Show; if in calf, birth must be certified within 9 months after the Show. This Rule does not apply to animals in Family Groups. Ayrshire Heifers in calf must produce a calf within one month of the first day of the Show.
- Family Groups.* 35. Cows in Family Groups must have had calves previous to the Show, and when exhibited they must be either in milk or in calf. Two-year-old Heifers in Family Groups must be certified to have been served before the Show, except Highland Heifers, which need not be served till 3 years old.
- Ayrshire Cows.* 36. All Milk Cows of the Ayrshire breed must be in the Yard on the evening of Monday, the day before the opening of the Show, before 8 o'clock, and they will be inspected by the Veterinary Surgeon, or other official of the Society, between 7 and 9 o'clock, to see if they have been milked dry; and if not, they must be milked under his direction. After the judging, all Milk Cows must be milked morning and evening.
- Tampering with animals.* 37. Any artificial contrivance or device of any description found on or proved to have been used on an animal, either for preventing the flow of milk or for any other improper purpose, will disqualify that animal from being awarded a Premium, and the Owner of said animal shall be prohibited from again entering Stock for any of the Society's General Shows, for such a period as the Directors may see fit.
- In-calf Heifers.* 38. Two-year-old Heifers of the Shorthorn, Aberdeen-Angus, and Galloway breeds, and three-year-old Highland Heifers, must be in calf when exhibited, and the Premiums will be withheld till birth be certified, which must be within 9 months after the Show.
- Mares* 39. Animals of any age that have had a calf must be shown as Cows.
40. Agricultural Mares with foal at foot must have produced foals after 1st January of the year of the Show. In the case of a Mare whose foal has died, she shall without further entry be eligible to compete among the Yeld Mares. Agricultural Yeld Mares must produce a foal within 12 months from the first day of the Show.
- Calves and Foals.* 41. With reference to Regulations 34 and 38, birth of at least a seven

months' calf must be certified ; and in regard to Regulation 40, birth of at least a nine months' foal ; or in the case of death, a Veterinary Surgeon's certificate must be produced certifying that at the time of death the animal was so far advanced with calf or foal that if it had lived it would have produced a calf or foal, as required by Rules 34, 38, 40, and 41.

42. No rug shall be hung up so as to conceal any animal in a horse-box or stall, except with special permission of the Steward of that department. *Concealing animals.*

43. Horses entered as Hunters must be jumped if required by the Judges. *Hunters.*

44. Judges are particularly requested to satisfy themselves, as far as possible, regarding the soundness of all Horses before awarding the Prizes, and to avoid giving a preference to animals showing symptoms of hereditary diseases. The Judges may consult the Society's Veterinary Surgeon if they deem it expedient. No protests on veterinary grounds will be received. *Soundness of Horses.*

45. All Ewes must have reared lambs in the year of the Show ; and Ewes of the Blackfaced and Cheviot breeds must be in milk, and have their lambs at foot. *Ewes*

46. Sheep must have been clipt bare after 1st January of the year of the Show, and the Judges are instructed to examine the fleeces of the Sheep selected for Prizes, and to cast those on which they find any of the former fleece. *Clipping.*

47. Sows must have reared pigs in the year of the Show or be in pig ; and Pigs must belong to the same litter, and be uncut. *Sows.*

48. In Poultry the Aged Birds must have been hatched previous to, and Cockerels and Pullets in, the year of the Show. *Poultry.*

49. Bulls must be secured by nose-rings, with chains or ropes attached, or with strong halters and double ropes. All Cattle must be tied in their stalls. *Securing Cattle.*

50. Servants in charge of Stock must bring their own buckets or pails, and a piece of rope or sheep-net to carry their forage. Mangers, sheep and pig troughs, will be provided. *Feeding appliances.*

51. Loose-boxes will be provided for Stallions, three, two, and one year-old entire Colts and Fillies, and for Mares with foals at foot ; closed-in stables for all the other Horses, and covered accommodation for the whole of the other Live Stock. Stalls for attendants on Cattle, Horses, and Sheep will be provided at same rates as those charged for Stock. *Accommodation for animals.*

52. Five days' supply of straw, hay, grass, and tares will be provided free by the Society. Any additional fodder or other kinds of food required will be supplied at fixed prices in the Forage-yard. Any servant removing bedding from an adjoining stall will be fined in double the amount taken. Exhibitors may fetch their own cake or corn to the Yard, but not grass, tares, hay, or straw. Coops, food, and attendance for Poultry will be provided by the Society. *Fodder.*

53. Cattle, Sheep, Swine, or Poultry cannot be removed from the Yard till 5 P.M. on Friday, the last day of the Show, except on certificate by the Veterinary Surgeon employed by the Directors, countersigned by the Steward of the department and the Secretary. *Removal.*

54. Horses may be withdrawn at the close of the Show on Tuesday, Wednesday, and Thursday, on a deposit of £5 for each animal, which shall be forfeited, along with any prize money it may have gained, if the animal is not brought back. They must return between 7 and 7.30 the following morning, and those not in before 8 shall forfeit 10s. Horse passes to be applied for at the Committee Room between 5 and 6 P.M. on Tuesday, and the deposit, unless forfeited in whole or in part, will be returned between 12.30 and 2.30 on Friday. *Withdrawal of horses over night.*

55. When the Stock is leaving the Yard, no animal is to be moved till ordered by those in charge of clearing the Yard. Those transgressing this Rule shall be liable to a fine of 10s., and detained till all the other Stock is removed. *Order in removal.*

JUDGING STOCK AND POULTRY.

- Opening Gates.* 56. On Tuesday, the first day of the Show, no person will be admitted, except Servants in charge of Stock, till 8 A.M., when the Gates are opened to the public.
- Judging.* 57. The Judges will commence their inspection at 10 A.M. The spaces reserved for the Judging will be enclosed, and no encroachment shall be permitted. In no case shall a Premium be awarded unless the Judges deem the animals to have sufficient merit; and where only one or two lots are presented in a section, and the Judges consider them unworthy of the Premiums offered, it shall be in their power to award a lower prize, or to suggest the removal of any lot which appears to them unworthy of a place in the Yard.
- Commendations.* 58. In addition to the Premiums, the Judges are authorised to award three Commendations in each section (except Poultry, where only two Prizes and one Commendation are to be awarded), if the entries are numerous and the animals of sufficient merit. These Commendations consist of—Very Highly Commended, Highly Commended, and Commended.
- Ayrshire Cows and Heifers.* 59. Ayrshire Cows which have not calved before the Show, whether entered in the class for Cows in Milk or for Cows in Calf, shall be judged along with the Cows in Calf, and Ayrshire Cows or Heifers which have calved before the Show—in whichever of the two classes entered—shall be judged along with Cows in Milk.
- Attending Members.* 60. One Member of Committee and one or two Directors shall attend each section of the Judges. It will be their duty to bring the animals out to the Judges and to see that no obstruction is offered to them, and that the space reserved for them is not encroached upon; to ticket the prize animals; to send the Nos. of prize animals to the Award Lectern; to assist the Judges in completing their return of awards; and should any difficulty arise, to communicate with the Stewards or Secretary.
61. It shall not be competent for any Exhibitor, nor for his Factor or Land-Steward, to act as a Judge or attending Member in any class in which he is competing.

DAIRY PRODUCE.

62. Dairy Produce will be received in the Showyard on Monday, the day before the opening of the Show, and till 8 A.M. on Tuesday, the first day of the Show. Judged at 10 A.M. on Tuesday. Exhibited Tuesday, Wednesday, Thursday, and Friday.

63. Dairy Produce must have been made on the Exhibitor's farm this year. No Exhibitor shall show more than one lot in each class. At least 1 cwt. of the variety of Butter exhibited must have been made during the Season. The lots must be fair samples. No lot can be removed from the Yard till 5 P.M. on Friday, the last day of the Show. The Society undertakes no responsibility for the receipt or despatch of exhibits.

STALL RENT.

64. The following rates shall be paid by Exhibitors when making their Entries:—

| | Members. | | Non-Members. | |
|--|----------|----|--------------|----|
| | s. | d. | s. | d. |
| Stalls for Cattle, each | 15 | 0 | 25 | 0 |
| Boxes for Stallions over 12 hands, and for 3 and 2 year-old entire Colts | 30 | 0 | 40 | 0 |
| Boxes for Mares, over 12 hands, with Foal at foot | 30 | 0 | 40 | 0 |
| Boxes for one-year-old entire Colts and Fillies | 20 | 0 | 30 | 0 |
| Boxes for Stallions, 12 hands and under | 20 | 0 | 30 | 0 |

| | Members. s. d. | Non-Members. s. d. |
|--|-------------------|-----------------------|
| Boxes for Mares, 12 hands and under, with Foal at foot | 20 0 | 30 0 |
| Stalls for Mares or Geldings, 12 hands and under | 15 0 | 20 0 |
| Stalls for all other Horses, each | 20 0 | 30 0 |
| Shed Accommodation for Machines for driving competitions, each | 5 0 | 10 0 |
| Sheep, per pen | 10 0 | 15 0 |
| Swine, per pen | 15 0 | 20 0 |
| Poultry, each entry | 3 0 | 5 0 |
| Dairy Produce, each entry | 4 0 | 6 0 |
| Stalls for Attendants and Shepherds, same rates as above. | | |
| Covered Booths for offices, 9 feet by 9 feet | 70 0 | 100 0 |
| Newspaper offices £2, 10s. | | |

Entries in more than one Class.—In the case of animals entered in more than one class, the entry fee shall be five shillings for each class after the first. This does not apply to the Jumping Competitions.

FINES FOR STOCK NOT FORWARD.

65. In order to lessen the number of vacant Stalls, the following fines shall be imposed on all Exhibitors whose animals are not forward: For Horses, 20s.; Cattle, 20s.; Sheep and Swine, 10s.; Poultry, 3s.;—this fine to be in addition to Entry Money. In the case of death or illness of an animal, a Veterinary Surgeon's Certificate is necessary for a remit of the fine. The absent animals must be reported by the Stewards to the Secretary.

EXTRA STALL FOR ATTENDANTS.

66. Exhibitors of Stock shall be entitled to take an extra Stall for the accommodation of their attendants without being liable to a fine, but they must state when making their Entry that the Stall is to be used for that purpose, and remit rent.

IMPLEMENTS AND OTHER ARTICLES.

67. Implements will be received in the Yard from Tuesday, 14th July, till 5 o'clock on the afternoon of Monday, 20th July. Exhibited Tuesday, Wednesday, Thursday, and Friday. The Schedule of Entry must be filled up so far as within the knowledge of the Exhibitor, and prices must be stated. *Admission.*

68. No Money Prizes or Medals, except when specially offered, will be given by the Society for Implements of any kind. *Premiums.*

69. Agricultural Implements, and Implements and collections of articles not Agricultural, will be received for Exhibition, but the Secretary is entitled to refuse Entries from dealers in articles not deemed worthy of Exhibition. *Refusing Entries.*

70. In order to encourage exhibits of Agricultural Implements from operative Blacksmiths and Carpenters in the district of the Show, open space will be provided for these in some less prominent part of the Yard at a charge of Entry Money of 1s. per running foot of frontage, 20 feet deep. *Local Operatives.*

71. Implements will be entered in the following sections—viz., 1st, Under Cover, for Agricultural Implements; 2d, Open, for Agricultural Implements; 3d, Exhibits not Implements of Husbandry, either under cover or open, as may be deemed necessary by the Secretary; 4th, Motion Yard; 5th, Open space for Agricultural Implements from operative *Order of Imple-ments.*

Blacksmiths and Carpenters in the district of the Show. Exhibitors must specify the space they require.

Articles not entered. 72. Every article to be exhibited must be entered on the Society's Entry Form. Any article not so entered that is taken to the Show is liable to be ordered out of, or removed from, the Showyard, or confiscated to the Society. Exhibitors infringing this rule are moreover liable to a fine of £1.

Selling by auction and noisy behaviour forbidden. 73. "Cheap-Jacks" are not admitted to the Showyard. The selling of goods by auction, shouting, and other behaviour calculated to annoy visitors or Exhibitors, are strictly forbidden. Exhibitors infringing this Regulation are liable to a fine of £1, and to have themselves and their goods ordered out of, or removed from, the Showyard, or to have their goods confiscated to the Society.

Placing Exhibits. 74. The articles of each Exhibitor must be all placed in one stand, except Implements in motion, and must not on any account extend beyond the allotted space. No article shall be moved out of its stand, or the stand dismantled, till the termination of the Show, at 5 P.M. on Friday. Those infringing this Rule shall be liable to a fine of 10s.

Removing Exhibits. 75. Exhibitors must arrange their own articles *within* the space allotted to them before 9 o'clock on Tuesday, and to the satisfaction of the Stewards in charge of the Implement Yard.

Handbills. 76. Exhibitors are not allowed to distribute handbills anywhere in the Yard except at their own Stand; and they must not for this or any other purpose encroach upon the adjacent alleys or open spaces.

Sweeping Stands, &c. 77. Exhibitors are required to have their Stands and the portions of the alleys immediately adjoining them swept up before eight o'clock on each morning of the Show.

Fuel. 78. All Machines requiring steam or fire must be entered as such in the Certificate, and will be placed in the Motion Yard. *Coke only shall be used in all cases where fire is required after 10 o'clock A.M.* Those infringing this Rule shall incur a penalty of £5.

Steam Engines. 79. No Steam Engine shall be driven in the Yard at a greater speed than 4 miles an hour. Traction Engines shall not be used in conveying Exhibits or other goods into, from one place to another in, or out of the Showyard.

80. Locomotive and Traction Engines and other Machines must not be moved from their places without permission of the Secretary or Stewards, and must not leave their stands till 6 P.M. on Friday.

Consigning Implements. 81. There must be attached to each Implement, when forwarded to the Show, a label bearing the Exhibitor's name, and that of the Implement, as well as the number of the Exhibitor's stand.

82. The carriage of all Implements must be prepaid.

Exhibitors' and Attendants' Tickets. 83. Each Exhibitor in the Implement Department will receive one free Ticket of Admission to the Showyard for himself or a member of his firm, and will receive, in addition, for the use of attendants employed by him at his Stand, two Tickets of Admission for each complete ten feet of shedding in the Motion Yard, and one Ticket for each complete ten feet of shedding in the other sections. No additional Free Tickets can be issued in any circumstances whatever. Additional Attendants' Tickets, not more than five for any one Exhibitor, may be purchased at 5s. each.

Tickets to be filled up and signed. 84. The Tickets of Admission for Exhibitors and Attendants referred to in the foregoing Regulation will (about fourteen days prior to the Show) be issued to the Exhibitors in blank, with the number of the Exhibitor's Stand. The name of the person for whom each ticket is intended must be written on it before it is used. Each person holding a Free Ticket of Admission must sign his or her name on the back thereof, and must also, when required, sign his or her name in the book at the Entrance Gate. Exhibitors' attendants are strictly cautioned not to lend or transfer their Tickets which can be used only by the persons whose names they bear, and

Tickets not Transferable.

who must be *bona fide* acting for, or employed by, the Exhibitor. No Ticket is transferable. An Exhibitor is liable to a fine of £1 for each case of transfer or other improper use of a Ticket issued to himself or employee. *Imd use Tic.*

STALL RENT.

85. Ground to be taken in spaces of 10 feet frontage by 20 feet deep, except in Motion Yard, which is to be 10 feet or any larger amount of frontage by 50 feet deep. Except for exhibits not agricultural, no boarding shall exceed 4 feet in height.

86. The following rates shall be paid by Exhibitors when making their Entries :—

| | Members. | Non-Members. |
|--|----------|--------------|
| Implement Shedding, 20 feet deep, 7 feet high, per 10 feet | £1 5 0 | £1 15 0 |
| Implements without Shedding, 20 feet deep, per 10 feet | 1 5 0 | 1 15 0 |
| Implement space in Motion Yard, without Shedding, 50 feet deep, per foot | 0 5 0 | 0 8 0 |
| And with Shedding, 20 feet deep, 10 feet high, per foot | 0 7 0 | 0 10 0 |
| Covered Booths for offices, 9 feet by 9 feet, each | 3 10 0 | 5 0 0 |
| Newspaper offices, each | £2, 10s. | |

ADMISSION OF THE PUBLIC.

The public will be admitted daily at 8 A.M. Judging begins on Tuesday at 10 A.M. The charges for admission to the Yard will be—Tuesday, from 8 A.M. till 5 P.M., 5s.; Wednesday, from 8 A.M. till 5 P.M., 3s.; Thursday, from 8 A.M. till 5 P.M., 2s.; from 5 P.M. till 8 P.M., 1s.; Friday, from 8 A.M. till 5 P.M., 1s.

ADMISSION OF MEMBERS AND EXHIBITORS.

On exhibiting their "*Member's Ticket*," which is strictly not transferable, Members of the Society are admitted free to the Showyard and to the Enclosures and Stands around the Large Ring, excepting the Centre Seats in the Grand Stand, and such other parts as may be reserved for any special purpose. Tickets will be sent to all Members residing in the United Kingdom whose addresses are known, and on no account will duplicates be issued. All Members not producing their tickets must pay at the gates, and the admission money will not on any account be returned.

Exhibitors of Stock (not Members) are admitted free to the Showyard on producing their tickets.

For Exhibitors of Implements and their assistants tickets are issued as provided in the Regulations for Implements.

Tickets for attendants on Stock are not available to admit to the Yard between 11 A.M. and 5 P.M.; and any of these attendants requiring to leave the Yard during the day cannot be again admitted except by a special pass (to be applied for at the Ticket Gate), which must be given up on his return.

RESERVED SEATS IN GRAND STAND.

Reserved Seats in the Grand Stand (numbered), are let as follows :—

Wednesday—Forenoon, 2s.; Afternoon, 3s.

Thursday—Forenoon, 2s.; Afternoon, 3s.

Friday—Forenoon, 1s. 6d.; Afternoon, 2s.

These Seats may be booked at any time prior to the Show on application to the Secretary with remittance for the amount; or in the Showyard

at the Treasurer's Office (Committee Room) till within half an hour of the Parades, and thereafter at the Grand Stand. The Directors reserve the right to alter these charges.

VARIOUS.

Placards, except those of the Society, are prohibited both inside the Showyard and on the outside of the Boundary Fence, with the exception of those belonging to Exhibitors, whose right is confined to their own stalls. No newspapers or any other article allowed to be carried about the Yard for sale or display. No strolling bands or musicians admitted.

No Carriages or Equestrians admitted without special leave from the Directors, and then only for Invalids. Bath-chairs may be brought in.

Premium Lists, Regulations, and Certificates of Entry may be obtained by applying at the Secretary's Office, No. 3 George IV. Bridge, Edinburgh.

All Communications should be addressed to JAMES MACDONALD, Esq., Secretary of the Highland and Agricultural Society of Scotland, No. 3 George IV. Bridge, Edinburgh.

Address for Telegrams—"SOCIETY," EDINBURGH.

LAST DAYS OF ENTRY.

IMPLEMENTS AND OTHER ARTICLES—Monday, 18th May.

STOCK, POULTRY, AND DAIRY PRODUCE—Monday, 15th June.

No Entry at ordinary fees taken later than those which are received at the Society's Office, Edinburgh, by first post, or 10 o'clock, on Monday morning (15th June). Post Entries for Cattle, Horses, Sheep, and Swine taken on payment of 10s. additional for each entry (Poultry at double fees) till Wednesday morning (17th June), at the Society's Office, Edinburgh, at 10 o'clock.

COVERED BOOTHS FOR OFFICES—Monday, 15th June.

RAILWAY ARRANGEMENTS.

The Railway Companies will be furnished with a list of the Exhibitors of Stock and Implements, after the 4th of July, and all applications for horse-boxes and trucks, and for information as to arrangements of Special Trains, must be made by the Exhibitors themselves with the Station-master where their stock is to be trucked.

The arrangements made by the Railway Companies for the conveyance of Live Stock and Goods to and from the Show are indicated in the following, but exhibitors are recommended to apply to the respective companies for full particulars:—

1. Live Stock and Goods *to* the Show to be charged ordinary rates.
2. Live Stock and Goods *from* the Show, *if sold*, to be charged ordinary rates.
3. Live Stock and Goods *from* the Show, *if unsold*, to be conveyed at half rates back to the station whence they were sent, at owners' risk, on production of a certificate from the Exhibitor to the effect that they are unsold; failing production of such certificate, ordinary rates must be charged. The reduction to half rate is to be allowed only when the animals or goods are returned by the same route as that by which they were conveyed to the Show. The minimum charge for Stock returned at half rates is one-half the ordinary minimum.

If the unsold Live Stock which was conveyed on the outward journey by Passenger Train in horse-boxes be required to be returned by Goods Train in cattle trucks, half the Goods Train rates must be charged.

If the unsold Live Stock which was conveyed on the outward journey by Goods Train in cattle trucks be required to be returned by Passenger Train in horse-boxes, half the Passenger Train rates must be charged.

4. Unsold Live Stock transferred from one Agricultural Show to another, in another part of the country, must be charged ordinary rates.

5. Unsold goods, previously carried by railway, transferred from one Agricultural Show to another, in another part of the country, will be conveyed at half rates at owners' risk, on production of Certificate from the Exhibitor to the effect that they are unsold; failing production of such certificate, ordinary rates will be charged.

6. Poultry to be charged ordinary rates both ways.

7. Horse-boxes, or other Passenger Train vehicle, must not be provided for the carriage of Live Stock sent by Goods Train and invoiced at Goods Train rates. *For rates for Horse-boxes by Passenger and Special Trains, apply to the Railway Companies.*

8. Provender conveyed to Agricultural Shows with Live Stock is to be charged ordinary rates, except so much of the same as may be required on the journey.

9. Men, certified by the owners to be *bona fide* in charge of Live Stock, to be conveyed free in the same train as the animals; one man to each consignment, or one to each vehicle if the consignment occupy more than one vehicle.

10. The ordinary rates do not include delivery to, or collection from, the Show ground.

11. Agricultural Societies' Show Plant must be charged at Class C rates, station to station.

12. Tents, Canvas, and other articles carried to Shows, not for exhibition, to be charged the ordinary rates both going and returning.

DELIVERY CHARGES.

Rates of Cartage for Delivery and Collection of Live Stock, Implements, and other Articles between the Perth Railway Station and the Show-yard.

1. General traffic, 2s. 6d. per ton (minimum per consignment, 1s. 6d.)
2. Implements and Machinery (Agricultural), not exceeding 1 ton each, 2s. 6d. per ton (minimum per consignment, 2s.)
3. Implements and Machinery (Agricultural), on their own wheels (specially hauled), not exceeding 1 ton, 2s. 6d. each.
4. Single articles, exceeding 1 ton, but not exceeding 3 tons, 3s. per ton.
5. Single articles, exceeding 3 tons, but not exceeding 5 tons, 6s. per ton.
6. Single articles, exceeding 5 tons, by special arrangement only, but no less than 8s. per ton.
7. Carriages, four-wheeled, 2s. 6d. each.
8. Carriages, two-wheeled, 1s. 6d. each.
9. Cattle, in floats, 2s. 6d. per head.
10. Sheep and Pigs, in floats, 9d. per head (minimum charge, 2s. 6d., and maximum charge, 5s. for each float).

The rates charged for carriage do not in any case include collection or delivery.

The carriage of all Live Stock, Implements, and other articles for exhibition at the Show must be prepaid.

ACCOMMODATION FOR VISITORS.

Information as to Apartments and Lodgings to let in Perth during the week of the Show may be had from Mr A. Forrester, House Agent, 66 George Street, Perth.

THE PRESIDENT'S CHAMPION MEDALS

A CHAMPION MEDAL is given by THE MARQUIS OF BREADALBANE, K.G., President of the Society, for the *best Animal or pen* in each of the following sections:—

- | | | |
|---|--|---|
| 1. Shorthorn. 2. Aberdeen-Angus. 3. Galloway. 4. Highland. 5. Ayrshire. 6. Clydesdale Stallions. 7. Draught Geldings. | 8. Clydesdale Mares and Filles. 9. Hunters. 10. Roadsters. 11. Hackneys. 12. Ponies. | 13. Shetland Ponies. 14. Blackfaced Sheep. 15. Cheviot. 16. Border Leicester. 17. Shropshire. 18. Swine. |
|---|--|---|

NOTE.—*Animals entered as Extra Stock may compete for these Medals. The award of these Medals is not subject to the Rules as to calving and foaling.*

CATTLE

| Class | SHORTHORN. | | | Premiums. | | |
|--|------------|--|--|-----------|-----|-----|
| | | | | 1st. | 2d. | 3d. |
| | | | | £ | £ | £ |
| 1. Bull calved before 1st Jan. 1894 . . . | | | | 15 | 10 | 5 |
| 2. Bull calved in 1894 . . . | | | | 15 | 10 | 5 |
| 3. Bull calved in 1895 . . . | | | | 12 | 8 | 4 |
| ¹ Best Bull of any age in the three Classes—£20. | | | | | | |
| Breeder of Best Bull of any age in the three Classes—The Silver Medal. | | | | | | |
| 4. Cow of any age . . . | | | | 12 | 8 | 4 |
| 5. Heifer calved in 1894 . . . | | | | 10 | 5 | 3 |
| 6. Heifer calved in 1895 . . . | | | | 10 | 5 | 3 |

President's Medal for best Shorthorn.

Carry forward ————— £144

ABERDEEN-ANGUS.

² Two Silver Cups, each of the value of £50, for the best Bull of any age and for the best Cow of any age (Heifers excluded) in the Aberdeen-Angus cattle classes. These are to be Challenge Cups, and are to be known as the "Ballindalloch Challenge Cups." They are offered under the following conditions: 1. The Directors shall assume charge of the Cups, and shall frame such rules for their safety as they may decide upon. 2. Each Cup shall be held by the winner for one year as a Challenge Cup, and shall become the property of the exhibitor who shall win it five times, not necessarily in succession. 3. The Society shall, at their own expense, cause to be engraved on each Cup each year, the year, the place of the Show, name of successful exhibitor, name and herd-book number of the animal, and name of its breeder. 4. The Society shall award to the breeder of the successful animals a Silver Medal, bearing that he is the breeder of the winner of the "Ballindalloch Challenge Cup." 5. In every other respect the Cups shall be won according to regulations which the Directors may from time to time enact.

¹ Given by the Shorthorn Society.

² Given by the late Mr Macpherson Grant of Drumduan.

| Brought forward | | £144 | | |
|-----------------------------------|--|------------|-----|-----|
| | | Premiums. | | |
| ABERDEEN-ANGUS— <i>continued.</i> | | 1st. | 2d. | 3d. |
| Class | | £ | £ | £ |
| 7. | Bull calved before 1st Dec. 1893 | 15 | 10 | 5 |
| 8. | Bull calved on or after 1st Dec. 1893 | 15 | 10 | 5 |
| 9. | Bull calved on or after 1st Dec. 1894 | 12 | 8 | 4 |
| | ¹ Champion Cup, value £50, for the best Bull of any age in the three Classes (see above). Breeder of best Bull of any age in the three Classes—The Silver Medal. | | | |
| 10. | Cow of any age | 12 | 8 | 4 |
| | ¹ Champion Cup, value £50, for the best Cow of any age in the above Class. | | | |
| 11. | Heifer calved on or after 1st Dec. 1893 | 10 | 5 | 3 |
| 12. | Heifer calved on or after 1st Dec. 1894 | 10 | 5 | 3 |
| | <i>President's Medal for best Aberdeen-Angus Animal.</i> | <hr/> | | |
| | | | | 144 |

GALLOWAY.

| | | | | |
|-----|--|-------|----|-----|
| 13. | Bull calved before 1st Jan. 1894 | 15 | 10 | 5 |
| 14. | Bull calved in 1894 | 15 | 10 | 5 |
| 15. | Bull calved in 1895 | 12 | 8 | 4 |
| | Breeder of Best Bull of any age in the three Classes—The Silver Medal. | | | |
| 16. | Cow of any age | 12 | 8 | 4 |
| 17. | Heifer calved in 1894 | 10 | 5 | 3 |
| 18. | Heifer calved in 1895 | 10 | 5 | 3 |
| | <i>President's Medal for best Galloway.</i> | <hr/> | | |
| | | | | 144 |

HIGHLAND.

| | | | | |
|-----|--|-------|----|-----|
| 19. | Bull calved before 1st Jan. 1894 | 15 | 10 | 5 |
| 20. | Bull calved in 1894 | 15 | 10 | 5 |
| 21. | Bull calved in 1895 | 12 | 8 | 4 |
| | Breeder of best Bull of any age in the three Classes—The Silver Medal. | | | |
| 22. | Cow of any age | 12 | 8 | 4 |
| 23. | Heifer calved in 1893 | 10 | 5 | 3 |
| 24. | Heifer calved in 1894 | 10 | 5 | 3 |
| | ² Group of Highland Cattle, consisting of Bull, Cow with Calf at foot, and either a Three-year-old Heifer or a Two-year old Heifer, drawn from foregoing Classes—the awards of these prizes not to be subject to the Rules as to calving. First Prize £10, Second £5. | | | |
| | <i>President's Medal for best Highland Animal.</i> | <hr/> | | |
| | | | | 144 |

Carry forward

£576

¹ Given by the late Mr C. Macpherson Grant of Drumduan.² Given by Mr T. V. Smith of Ardtornish.

| Brought forward | | | | ... | ... | £576 |
|--|--|---|---|-----------|-----|------|
| | | | | Premiums. | | |
| | | | | 1st. | 2d. | 3d. |
| Class | AYRSHIRE. | | | £ | £ | £ |
| 25. | Bull calved before 1st Jan 1894 | . | . | 15 | 10 | 5 |
| 26. | Bull calved in 1894 | . | . | 12 | 8 | 4 |
| 27. | Bull calved in 1895 | . | . | 8 | 5 | 3 |
| Breeder of Best Bull of any age in the three Classes—The Silver Medal. | | | | | | |
| 28 | Cow in Milk, any age | . | . | 10 | 7 | 3 |
| 29 | Cow of any age in Calf, or Heifer calved in 1893 in Calf and due to calve within one month of the first day of the Show | . | . | 10 | 7 | 3 |
| 30. | Heifer calved in 1894 | . | . | 10 | 5 | 3 |
| 31. | Heifer calved in 1895 | . | . | 8 | 5 | 3 |
| <i>President's Medal for best Ayrshire.</i> | | | | <hr/> | | |
| | | | | | | 144 |
| DAIRY COWS. | | | | | | |
| 32. ¹ | Dairy Cow, any pure breed or cross, £5, £3, £2. | | | | | |
| 33 | Shorthorn Cow, any age, in Milk, entered in, or eligible for, Coates Herd-Book. First Prize £10, ² Second £5. | | | | | |
| 34. | Aberdeen-Angus Cow, any age, in Milk, entered in, or eligible for, the Polled Herd-Book. First Prize £10, ⁴ Second £5. ⁵ | | | | | |
| | | | | <hr/> | | |
| | | | | | | 10 |
| | | | | <hr/> | | |
| | | | | | | £730 |

HORSES

FOR AGRICULTURAL PURPOSES.

CAWDOR CHALLENGE CUP, VALUE 50 GUINEAS, FOR BEST MARE.

Conditions of Competition.—1. These Cups are, through the kindness of the Right Honourable the Earl Cawdor, President for the year 1891-92, offered by the Clydesdale Horse Society of Great Britain and Ireland—one for the best Clydesdale Stallion or Entire Colt registered in the Clydesdale Stud-book, and the other for the best Clydesdale Mare or Filly registered in the Clydesdale Stud-book, entered in any of the Draught Horse classes, at the show or shows at which they may be competed for. 2. The Council of the Clydesdale Horse Society shall, at a meeting held not later than the month of August in any year, decide at what show or shows the "Cawdor Challenge Cups" shall be competed for in the year immediately following. 3. Either of these Cups must be won three times by an exhibitor (but not necessarily in consecutive years or with the same animal) before it becomes his absolute property; and immediately after an award has been made, and official notification thereof has been received by the Secretary of the Clydesdale Horse Society from the Secretary of the Society under whose auspices the competition has taken place, the name of the winner, and of the animal with which the Cup has been won, will be engraven on the Cup. 4. The winner of either of the Cawdor Challenge Cups, other than the absolute

¹ Given by Mr D. Stewart, Murhall, Perth, and others.

² Given from the Shorthorn Dairy Prize Fund.

⁴ Given by Mr W. S. Ferguson, Pictstonhill.

³ Given by the Society.

⁵ Given by the Society.

winner, shall, before delivery thereof is made to him, give security to the Clydesdale Horse Society that he shall surrender the same to the Society and deliver it at the Society's office when called upon to do so. 5. Until the Cup or Cups be won outright, the winner of either Challenge Cup will receive the Clydesdale Horse Society's Silver Medal as a memento of his winning the Cup; and the said Medal shall bear an inscription specifying the show at which, the date on which, and the name of the animal with which the Challenge Cup has been won, as well as the name of the owner. In name of the Council of the Clydesdale Horse Society, and as approved, first, by its Committee, Messrs R. Sinclair-Scott, John M. Martin, and James Park, and finally, by the Right Hon. the Earl Cawdor, its President.

AROLD. MACNILLAGE, *Secretary.*

For the above Cup all former prize animals at the Society's Shows, now disqualified from competing in the ordinary classes, are permitted to compete. The Clydesdale Horse Society to have the option of photographing the winner for publication in the Clydesdale Stud-book.

| Class | DRAUGHT STALLIONS. | Premiums. | | | |
|--|--------------------|-----------|------|-----|------|
| | | 1st. | 2d. | 3d. | 4th. |
| 35. Stallion foaled before 1st Jan. 1893 | | £ 15 | £ 12 | £ 8 | £ 4 |
| 36. Entire Colt foaled in 1893 . . . | | 15 | 12 | 8 | 4 |
| 37. Entire Colt foaled in 1894 . . . | | 15 | 10 | 6 | 3 |
| 38. Entire Colt foaled in 1895 . . . | | 12 | 7 | 4 | 2 |

¹ Best Stallion in the foregoing

Classes—Champion Prize of £10.

Breeder of Best Male Animal of any age in the four Classes—The Silver Medal.

President's Medal for best Clydesdale Stallion.

| DRAUGHT GELDINGS. | | | | |
|---|--|---|---|---|
| 39. Draught Gelding foaled before 1st Jan. 1893 . . . | | 8 | 4 | 2 |
| 40. Draught Gelding foaled in 1893 . . . | | 5 | 3 | 2 |
| 41. Draught Gelding foaled in 1894 . . . | | 5 | 3 | 2 |

President's Medal for best Draught Gelding.

| DRAUGHT MARES AND FILLIES. | | | | | |
|---|--|----|----|---|---|
| 42. Mare of any age, with Foal at foot . | | 15 | 10 | 5 | 3 |
| 43. Yeld Mare foaled before 1st Jan. 1893 | | 10 | 6 | 3 | 2 |
| 44. Filly foaled in 1893 . . . | | 10 | 6 | 3 | 2 |
| 45. Filly foaled in 1894 . . . | | 10 | 6 | 3 | 2 |
| 46. Filly foaled in 1895 . . . | | 10 | 6 | 3 | 2 |

Best Mare or Filly registered in the Clydesdale Stud-book—Cawdor Challenge Cup, value 50 Guineas (see p. 72).

President's Medal for best Clydesdale Mare or Filly.

288

Carry forward £288

¹ Given by Mr James Lockhart, Mains of Aines.

No animal is allowed to compete in more than one Class, except that horses entered in other Classes may also compete in the Jumping and Driving Classes.

No animal is allowed to compete in more than one Class, except that horses entered in other Classes may also compete in the Jumping and Driving Classes.

| | | Brought forward | | | £454 |
|-----------------------------|--|------------------------|-----|-----|--|
| | | Premiums. | | | |
| | | 1st. | 2d. | 3d. | |
| HACKNEYS— <i>continued.</i> | | £ | £ | £ | |
| Class | | | | | |
| 60. | Entire Colt, foaled in 1894, registered in Hackney Stud-book . . | 6 | 4 | 2 | |
| 61. | Entire Colt, foaled in 1895, eligible for entry in Hackney Stud-book . . | 6 | 4 | 2 | |
| ¹ | Gold Medal value £10 by Hackney Horse Society for best Mare or Filly in Hackney or Pony Classes. | | | | 24 |
| | | | | | <i>President's Medal for best Hackney.</i> |
| | | | | | The Scotch Committee of the Hackney Horse Society gives £35 towards the above Prizes for Hackneys. |

PONIES.

| | | | | | |
|-----|---|---|---|---|---|
| 62. | Stallion, over 12, not exceeding 14.2 hands | 4 | 2 | 1 | |
| 63. | Mare or Gelding, between 13 and 14½ hands | 4 | 2 | 1 | |
| 64. | Mare or Gelding, between 12 & 13 hands | 4 | 2 | 1 | |
| 65. | Stallion, under 12 hands | 4 | 2 | 1 | |
| 66. | Mare or Gelding, under 12 hands | 4 | 2 | 1 | |
| | | | | | 35 |
| | | | | | <i>President's Medal for best Pony.</i> |

SHETLAND PONIES.

| | | | | | |
|-----|--|---|---|---|--|
| 67. | Stallion, not exceeding 10½ hands, foaled before 1st Jan. 1893 | 4 | 2 | 1 | |
| 68. | Mare, not exceeding 10½ hands, with foal at foot | 4 | 2 | 1 | |
| 69. | Mare or Gelding, 10½ hands, foaled before 1st Jan. 1893 | 4 | 2 | 1 | |
| | | | | | 21 |
| | | | | | <i>President's Medal for best Shetland Pony.</i> |

DRIVING COMPETITIONS.

| | | | | | |
|-----|--|---|---|---|----|
| 70. | Best Turn-out of single Horse, Harness, and Trap, to be driven in the ring, 15 hands and upwards | 8 | 4 | 2 | |
| 71. | Best Turn-out of single Horse, Harness, and Trap, to be driven in the ring, under 15 hands | 8 | 4 | 2 | |
| | | | | | 28 |

£562

¹ A Mare 6 years old or more must have had a living foal. Winners of the Hackney Society's Medals in 1896, except at the London and Royal English Shows, excluded. The winner must be entered or accepted for entry in Hackney Stud-book, and certified free from hereditary disease. The Gold Medal being of the intrinsic value of £10, that amount will be paid by the Hackney Horse Society at any time if the Medal be returned in good condition.

No animal is allowed to compete in more than one Class, except that horses entered in other Classes may also compete in the Jumping and Driving Classes.

JUMPING COMPETITIONS—See page 78.

No animal is allowed to compete in more than one Class, except that horses entered in other Classes may also compete in the Jumping and Driving Classes.

S H E E P

| Class | BLACKFACED. | Premiums. | | |
|--|-------------|-----------|-----|-----|
| | | 1st. | 2d. | 3d. |
| | | £ | £ | £ |
| 72. Tup above one shear | | 10 | 5 | 3 |
| 73. Shearling Tup | | 10 | 5 | 3 |
| ¹ Best Blackfaced Tup in the foregoing Classes—Champion Prize of £10. | | | | |
| 74. Three Ewes above one shear, with their Lambs at foot | | 8 | 4 | 2 |
| 75. Three Shearling Ewes or Gimmers | | 8 | 4 | 2 |
| | | | | £64 |

President's Medal for best pen of Blackfaced Sheep.

| CHEVIOT. | | | | |
|--|--|----|---|----|
| 76. Tup above one shear | | 10 | 5 | 3 |
| 77. Shearling Tup | | 10 | 5 | 3 |
| 78. Three Ewes above one shear, with their Lambs at foot | | 8 | 4 | 2 |
| 79. Three Shearling Ewes or Gimmers | | 8 | 4 | 2 |
| <i>President's Medal for best pen of Cheviot Sheep.</i> | | | | 64 |

| BORDER LEICESTER. | | | | |
|---|--|----|---|------|
| Tweeddale Gold Medal for Best Border Leicester Tup—£20. | | | | |
| 80. Tup above one shear | | 10 | 5 | 3 |
| 81. Shearling Tup | | 10 | 5 | 3 |
| 82. Three Ewes above one shear | | 8 | 4 | 2 |
| 83. Three Shearling Ewes or Gimmers | | 8 | 4 | 2 |
| <i>President's Medal for best pen of Border Leicesters.</i> | | | | 64 |
| Carry forward | | | | £192 |

¹ Given by Sir T. D. Gibson Carmichael, Bart.

| | | Brought forward | | | £192 |
|---|---|------------------------|-----|-----|------|
| | | Premiums. | | | |
| Class | SHROPSHIRE. | 1st. | 2d. | 3d. | |
| | | £ | £ | £ | |
| 34. | Tup above one shear | 6 | 4 | 2 | |
| 35. | Shearling Tup | 6 | 4 | 2 | |
| 36. | Three Ewes above one shear | 5 | 3 | 2 | |
| 37. | Three Shearling Ewes or Gimmers | 5 | 3 | 2 | |
| <i>President's Medal for best pen of Shropshires.</i> | | | | | 44 |

EXTRA SECTIONS.

| | | | | | |
|---|--|---|---|---|------|
| 38. | Three Blackfaced Wethers, one shear | 4 | 2 | — | |
| 39. | Three Cheviot Wethers, one shear . | 4 | 2 | — | |
| 90. | Three Shearling Wethers, any cross out of Blackfaced Ewes | 4 | 2 | — | |
| 91. | Five Fat Lambs, any breed or cross . | 4 | 2 | — | |
| ¹ Best Pens of Cross-bred Lambs in Class 91 got by Shropshire Tups —Three Prizes—£5, £3, £2. | | | | | |
| | | | | | 24 |
| | | | | | £260 |

SWINE

| | | Premiums. | | | |
|-------|--------------------------------------|-----------|-----|--|----|
| | | 1st. | 2d. | | |
| Class | LARGE WHITE BREED. | £ | £ | | |
| 92. | Boar | 4 | 2 | | |
| 93. | Sow | 4 | 2 | | |
| 94. | Three Pigs, not above 8 months old . | 4 | 2 | | |
| | | | | | 18 |

WHITE BREED OTHER THAN LARGE.

| | | | | | |
|-----|--------------------------------------|---|---|--|----|
| 95. | Boar | 4 | 2 | | |
| 96. | Sow | 4 | 2 | | |
| 97. | Three Pigs, not above 8 months old . | 4 | 2 | | |
| | | | | | 18 |

BERKSHIRE.

| | | | | | |
|---|--------------------------------------|---|---|--|-----|
| 98. | Boar | 4 | 2 | | |
| 99. | Sow | 4 | 2 | | |
| 100. | Three Pigs, not above 8 months old . | 4 | 2 | | |
| <i>President's Medal for best pen of Swine.</i> | | | | | 18 |
| | | | | | £54 |

¹ Given by Scotch Breeders of Shropshire Sheep, per Mr David Buttar.

JUMPING COMPETITIONS

SPECIAL REGULATIONS.

(See also the Regulations on pages 59 to 69.)

1. Jumping Competitions will take place on the afternoons of Wednesday, Thursday, and Friday, the 22d, 23d, and 24th July.
2. Entries for each day's Competitions will close at the Secretary's Office in the Showyard at 6 P.M. on the preceding day.
3. *Entry Fees*.—For classes for Horses—Wednesday, £1; Thursday and Friday, 10s. for each class. Pony classes—Wednesday, 10s.; Thursday and Friday, 5s. for each class.
4. *Accommodation* for jumping horses will be provided as follows:—Covered shed in which to stand during the day free of charge; or, on application to the Secretary not less than seven days before the opening of the Show, stalls or loose-boxes will be provided at a charge (in addition to the Entry Fee) of £1 for a stall, and £1, 10s. for a loose-box, which must be paid along with the Entry Fee at the time of application.
5. Horses entered for jumping only need not enter the Showyard till 10 A.M. on the day of Competition, and may leave the Showyard at 6 P.M. each day.
6. *The Jumps* may consist of Single Hurdle, Gate, Double Hurdle, Wall, and Water Jump, power being reserved by the Society to alter these, as well as the Handicaps, as may be thought desirable.

WEDNESDAY.

| Class | 1st. | 2d. | 3d. |
|--|------|-----|-----|
| | £ | £ | £ |
| 1. Horses—open | 20 | 10 | 5 |
| 2. Ponies, 14½ hands and under | 5 | 3 | 1 |

THURSDAY.

| | | | |
|--|----|---|---|
| 3. Horses, Open Handicap, hurdles and gate being raised 8 inches for the winner of the first prize, and 4 inches for the winner of the second prize in Class 1 | 10 | 6 | 3 |
| 4. Ponies, 14½ hands or under, Handicap, hurdles and gate being raised 4 inches for first prize winner in Class 2 | 5 | 3 | 1 |

FRIDAY.

| | | | |
|--|----|---|---|
| 5. Horses, Open Handicap, hurdles and gate being raised 8 inches for the winner of the first prize, and 4 inches for the winner of the second prize in either of Classes 1 or 3—4 inches extra for the winner of the two first prizes in Classes 1 and 3 | 10 | 6 | 3 |
| 6. Ponies, 14½ hands or under, Handicap, hurdles and gate being raised 4 inches for the winner of the first prize in Class 2 or in Class 4, and 8 inches for winner of the first prize in both these Classes | 3 | 2 | 1 |

£97

Champion Prize¹ of £10 for most points in Prizes for Jumping by one Exhibitor with one or more horses in above Classes—First Prize to count three points; Second Prize, two points; and Third Prize, one point. The money to be evenly divided in the event of a tie.

¹ By various Contributors.

EXTRA STOCK

Animals not included in the Classes for Competition may be exhibited as Extra Stock, and may receive Honorary Mention, as follows :—Very highly commended, Highly commended, or Commended.

Animals entered as Extra Stock are eligible to compete for the President's Champion Medals.

POULTRY

First Premium — ONE SOVEREIGN ; *Second Premium* — TEN SHILLINGS ; one Commended Ticket—in all the Sections of Poultry.

Aged Birds must have been hatched previous to, and Cockerels and Pullets in, 1896.

| | Class | Class |
|-------------------------------------|-------------------|--------------|
| DORKING— <i>Silver Grey</i> . | 1. Cock | 2. Hen |
| | 3. Cockerel | 4. Pullet |
| DORKING— <i>Coloured</i> . | 5. Cock | 6. Hen |
| | 7. Cockerel | 8. Pullet |
| COCHIN-CHINA . . . | 9. Cock | 10. Hen |
| | 11. Cockerel | 12. Pullet |
| BRAHMAPOOTRA . . . | 13. Cock | 14. Hen |
| | 15. Cockerel | 16. Pullet |
| SCOTCH GREY . . . | 17. Cock | 18. Hen |
| | 19. Cockerel | 20. Pullet |
| HAMBURG . . . | 21. Cock | 22. Hen |
| | 23. Cockerel | 24. Pullet |
| PLYMOUTH ROCK . . . | 25. Cock | 26. Hen |
| | 27. Cockerel | 28. Pullet |
| MINORCA . . . | 29. Cock | 30. Hen |
| | 31. Cockerel | 32. Pullet |
| LEGHORN . . . | 33. Cock | 34. Hen |
| | 35. Cockerel | 36. Pullet |
| LANGSHAN . . . | 37. Cock | 38. Hen |
| | 39. Cockerel | 40. Pullet |
| WYANDOTTE . . . | 41. Cock | 42. Hen |
| | 43. Cockerel | 44. Pullet |
| ANY OTHER PURE BREED | 45. Cock | 46. Hen |
| | 47. Cockerel | 48. Pullet |
| GAME— <i>Black or Brown Reds</i> | 49. Cock | 50. Hen |
| | 51. Cockerel | 52. Pullet |
| GAME— <i>Any other Pure Breed</i> } | 53. Cock | 54. Hen |
| | 55. Cockerel | 56. Pullet |
| BANTAMS— <i>Any Pure Breed</i> | 57. Cock | 58. Hen |
| | 59. Cockerel | 60. Pullet |
| DUCKS— <i>White Aylesbury</i> | 61. Drake | 62. Duck |
| | 63. Drake (Young) | 64. Duckling |
| DUCKS— <i>Rouen</i> . . . | 65. Drake | 66. Duck |
| | 67. Drake (Young) | 68. Duckling |

| | Class | Class |
|------------------------------------|--------------------|-----------------|
| DUCKS— <i>Any other Pure Breed</i> | 69. Drake | 70. Duck |
| | 71. Drake (Young) | 72. Duckling |
| TURKEYS— <i>Any Pure Breed</i> | 73. Cock | 74. Hen |
| | 75. Cock (Poult) | 76. Hen (Poult) |
| GEESE— <i>Any Pure Breed</i> | 77. Gander | 78. Goose |
| | 79. Gander (Young) | 80. Gosling |

Amount of Poultry Premiums, £120.

DAIRY PRODUCE

| Class | Premiums. | | |
|---|-----------|-----|-----|
| | 1st. | 2d. | 3d. |
| | £ | £ | £ |
| 1. Cured Butter, not less than 7 lb. | 4 | 2 | 1 |
| 2. Powdered Butter, not less than 7 lb. | 4 | 2 | 1 |
| 3. Fresh Butter, three 1-lb. rolls | 4 | 2 | 1 |
| | <hr/> | | |
| | £21 | | |

No Exhibitor to show more than one lot in any Class.

HORSE - SHOEING

(Prizes given by various contributors, per Mr W. S. Ferguson and Mr Andrew Hutchison.)

Open to Shoeing-Smiths from any part of the Counties of Perth, Forfar, Fife, and Kinross.

Class I. DRAUGHT-HORSES.—*Thursday*, at 10 A.M.

Prizes: 1st, £3; 2d, £2; 3d, £1.

Class II. ROADSTERS.—*Friday*, at 10 A.M.

Prizes: 1st, £3; 2d, £2; 3d, £1.

1. Entries must be made with the SECRETARY not later than 15th June. Entry Fee, 5s. for each Competition. Entry Forms may be had on application.

2. Each Competitor will be required to make, take off, and put on one or two shoes, as may be directed by the Judge.

[Iron of the usual sizes will be supplied by the Society.]

3. The time occupied by each Competitor will be taken by the attending Member and given to the Judge if he is unable to decide otherwise.

4. The competitor must bring his own tools and nails, and provide his own striker, if he requires one. The Society will provide horses, forge, anvil, iron, and fuel.

5. Any Competitor who does not attend at the Horse-Shoeing Shed and answer to his name at 10 A.M. on the day on which he is entered for competition, will be debarred from competing.

6. The Competitor and his striker will be admitted to the Yard free of charge on the day of Competition on presentation of tickets which will be sent to the Competitor for the purpose.

EXHIBITION OF BINDERS

An exhibition of Binders at work will be held in the district of the Show during the Harvest of 1896. Entries close July 4. Entry Fee for each machine, £1. Particulars may be had on application to the Secretary

TRIAL OF CORN-DRESSING MACHINES

A competitive trial of Corn-Dressing Machines will be held in the Showyard, or at such other time and place as may be afterwards arranged,—First Prize, £15; Second, £5. Entries close Monday, 15th June. Entry Fee for each Machine, £1. Particulars may be had on application to the Secretary.

HORSELESS CARRIAGES

A display of Horseless Carriages will take place in the Showyard. Particulars may be had from the Secretary.

ABSTRACT OF PREMIUMS.

[18 CHAMPION MEDALS GIVEN BY THE MARQUIS OF BREADALBANE.]

GIVEN BY THE SOCIETY.

| | | | |
|------------------------------------|-------|---|---|
| 1. Cattle | £730 | 0 | 0 |
| 2. Horses | 562 | 0 | 0 |
| 3. Jumping | 97 | 0 | 0 |
| 4. Sheep | 260 | 0 | 0 |
| 5. Swine | 54 | 0 | 0 |
| 6. Poultry | 120 | 0 | 0 |
| 7. Dairy Produce | 21 | 0 | 0 |
| 8. Medals to Breeders, &c. | 6 | 0 | 0 |
| 9. Machinery Trials | 20 | 0 | 0 |
| | <hr/> | | |
| | £1870 | 0 | 0 |

Less—Amount contributed by the Scotch
Committee of the Hackney Horse Society,

| | | | |
|--------------------|-------|---|---|
| as below | 35 | 0 | 0 |
| | <hr/> | | |
| | £1835 | 0 | 0 |

GIVEN BY

| | | | |
|--|-----|-------|-----|
| 1. The Shorthorn Society | £20 | 0 | 0 |
| 2. The late Mr C. Macpherson Grant of Drumduan,—Cups | 100 | 0 | 0 |
| 3. Mr T. V. Smith of Ardtornish | 15 | 0 | 0 |
| 4. Mr D. Stewart, Perth, and others | 10 | 0 | 0 |
| 5. Shorthorn Dairy Prize Fund | 10 | 0 | 0 |
| 6. Mr W. S. Ferguson, Pictstonhill | 10 | 0 | 0 |
| 7. Mr Lockhart, Mains of Airies | 10 | 0 | 0 |
| 8. Cawdor Cup | 52 | 10 | 0 |
| 9. Mr Gilmour of Montrave | 25 | 0 | 0 |
| 10. Hunters' Improvement Society | 10 | 10 | 0 |
| 11. The Scotch Committee of the Hackney Horse Society | 35 | 0 | 0 |
| 12. Hackney Horse Society | 10 | 0 | 0 |
| 13. Sir T. D. Gibson Carmichael, Bart. | 10 | 0 | 0 |
| 14. Scotch Breeders of Shropshire Sheep | 10 | 0 | 0 |
| 15. Tweeddale Gold Medal | 20 | 0 | 0 |
| 16. Various Contributors (for Jumping) | 10 | 0 | 0 |
| 17. Various Contributors (for Horse- Shoeing) | 12 | 0 | 0 |
| | | | |
| | | 370 | 0 0 |
| | | £2205 | 0 0 |

JAMES MACDONALD, *Secretary*.

3 GEORGE IV. BRIDGE,
EDINBURGH, *March* 1896.

The General Show of Stock and Implements will
be held at Glasgow in 1897.

MEMBERS ADMITTED SINCE THE LIST WAS PUBLISHED IN APRIL 1895.

ARRANGED ACCORDING TO SHOW DISTRICTS.

ELECTED JUNE 19, 1895, AND JANUARY 22, 1896.

1.—GLASGOW DISTRICT.

ARGYLL.

Admitted

- 1895 Forbes, James, Factor, Ballabus, Bridge-
end, Islay
1895 Fraser, Hugh, Factor, Large Estate
Office, Tayinloan, Argyllshire
1896 Hay, Colin E., Mungostell, Dumnin
1896 MacArthur, Alex., Banker, Oban
1896 M'Millan, Dr D., Tarbert, Argyllshire
1896 Malcolm, Colonel J. W., of Poltalloch,
Lochgilphend
1895 Tarratt, J. Fox, Ellary, by Ardrishaig

AYR.

- 1895 Clark, James, of Nunland Common,
Auchinleck
1895 Craig, John, Royal Bank House, New
Cumnock
1896 Crawford, Jn., jun., Manrahead, Beith
1895 Dunlop, James, Midland, Fenwick
1895 Hood, James, Dormiston, Coyiton
1896 Howatson, Chas. Nile, yr. of Glenbuck,
Glenbuck, N.B.
1895 Hunter, Matthew, Foulton, Monkton,
Ayrshire
1895 Inglis, Chas. D., Stair House, Tarbolton
1895 Kennedy, Roland F., of Funnarts, Glen-
app, Ballantrae
1896 Kilpatrick, James, Craigie Mains, Kil-
marnock

- 1895 Lees, Robert, Lagg, Ayr
1895 Landsay, Thomas C., Aitkenbrae, Monk-
ton, Ayrshire
1895 Wallace, Wm., Cattle Dealer, Manchline
1895 Young, Jn., Mid-Launces, New Cumnock

LANARK.

- 1895 Fleming, William, Calla, Carnwath
1896 Hamilton, George L., 25 Robertson St.,
Glasgow
1895 Lawrie, James, West Newton, Strath-
aven, Lanarkshire
1896 M'Kinlay, Robert, Hillhouse, Sandilands,
Lanark
1895 Marshall, Robert C., Caldergrove, New-
ton, Glasgow
1896 Turnbull, Wm., Daldowie, Broomhouse,
Glasgow
1896 Watkins, G. S., 186 West George Street,
Glasgow

RENFREW.

- 1895 Ballantyne, William, Busbyside, Busby
1895 Lambie, Jas., Bonnington Moor, Eagles-
ham
1895 Steven, Wm., Low Borland, Eaglesham

2.—PERTH DISTRICT.

FIFE.

- 1895 Bonthrone, James, Farmer, Hayfield,
Kirkcaldy
1896 Gordon, Rev. Aeneas G., The Manse,
Kettle
1895 Irving, John, Estate Office, Knockhill,
Newport, Fife
1895 Lumsden, John Lawson, Freuchie, Fife
1896 Nasmyth, Alex. Hogg, Middlebank,
Dunfermline
1895 Ness, Walter, Potato Merchant, Freuchie,
Fife

- 1896 Readdie, Ebenezer Robert, Letham,
Leven
1895 Russell, George, Cadham, Markinch

FORFAR.

(WESTERN DIVISION.)

- 1895 Forrest, James, Banker, Kirriemuir
1896 Kininmonth, John, 48 Castle Street,
Forfar

KINROSS.

1896 Dawson, James A. Ramage, of Balado, Kinross

PERTH.**(EASTERN DIVISION.)**

1896 Barnett, Thomas, Ballindean, Inchtute
 1895 Butter, Archibald Ed., of Faskally, Pitlochry
 1896 Chalmers, William, Mains of Fingask, Errol
 1896 Currie, Sir Donald, of Garth and Glenlyon, K.C.M.G., M.P., Garth Castle, Aberfeldy
 1896 Gilbert, T. Johnson, of Coldoch, Blair Drummond, Stirling

1896 Graham, James, Scoones, Lethendy, Perth
 1896 Hay, Lord, of Kinfauns, Dupplin Castle, Perth
 1895 Hutchison, William, Beechwood, Perth
 1896 Jackson, Thos. C., Tullylumb, Perth
 1895 Martin, James, Eastbank, Longforgan
 1895 Meldrum, A. G., Manse of Logierait, Ballinluig
 1895 Millar, David, Tullymoran, Logie Almond
 1895 Murray, Hon. Alexander David, Ardgilzean, Perth
 1896 Osler, James B., Coupar-Angus
 1896 Richardson, Sir E. A. Stewart, of Pitfour, Bart, Glencarse, Perth
 1896 Smith, David, Corsiehill, Perth
 1896 Smith, John, Eastfield, Bridge of Earn

3.—STIRLING DISTRICT.**DUMBARTON.**

1895 Davie, William, jun., Main Street, Alexandria, N.B.

PERTH.**(WESTERN DIVISION.)**

1895 Smeaton, Thomas Wright Burgh, Woodside, Auchterarder

STIRLING.

1895 Murray, Watson, Catter House, Drymen
 1895 Peareth, John Lennox, Lennox Castle, Campsie Glen, Stirlingshire
 1896 Wilson, John E., Burnside, Alva
 1896 Yuille, Andrew B., of Darleith, Bellevue, Bridge of Allan

4.—EDINBURGH DISTRICT.**EDINBURGH.**

1896 Burness, C., 2 Lennox Street
 1895 Campbell, James, Illieston, Mid-Calder
 1895 Clay, Alexander Thomson, W.S., 24 Charlotte Square
 1896 Crabbie, George, of Blairhoyle, 56 Palmerston Place
 1896 Findlay, John Ritchie, of Aberlour, 3 Rothesay Terrace
 1895 Fleming, C. J. N., Fettes College
 1895 Gibson, Thomas R., Bainfield Iron Works, Fountainbridge
 1896 Kirkwood, W. H., Lothian Bridge, Dalkeith
 1896 Macfie, R. A., Dreghorn, Colinton
 1896 Mackinnon, William, 144 Princes Street
 1895 Stedman, James, jun., Middelton, Mid-Lothian
 1895 Thomson, James Wishart, of Glenpark, Balerno

1896 Tullo, James, 2 Hanover Street
 1896 Young, John, Straiton, Loanhead

HADDINGTON.

1895 Curr, William Simpson, Ninevar, Prestonkirke
 1896 Nisbet, George, West Pencaitland Farm, East Lothian
 1895 Ronaldson, George, Kilduff Mains, Drem

LINLITHGOW.

1895 Allison, David, Newton, by Winchburgh
 1895 Bowie, Robt., Parkhead, by Linlithgow
 1895 Caddell, Henry M., of Grange, Grange House, Bo'ness, Linlithgowshire
 1895 Fleming, H. B., The Haugh, Kirkliston
 1895 Smith, John, Hopetoun Gardens, South Queensferry
 1895 Wilson, David, Riccarton, by Linlithgow

5.—ABERDEEN DISTRICT.**ABERDEEN.**

1895 Annand, John F., Banchory—Free Life Member
 1895 Cantlay, John, Ashallow, Cruden
 1895 Dallas, James, Employers' Liability and Accident Insurance Co., Gartly, Aberdeenshire
 1896 Davidson, Capt. D. F., 79th Cameron Highlanders, of Dess, Aberdeenshire
 1896 Diack, James, Pittodrie, Pitcairle
 1895 Fletcher, Alex., Land Steward, The Mains, Glenbucket, N.B.

1895 Minty, Wm., Crimmonmogate Mains, Loanmay, Aberdeenshire
 1895 Pirie, A. C., Craibstone House, Buxburn, by Aberdeen
 1896 Shepherd, William, Bellestraid, Logie Coldstone, Dinnet
 1895 Wilson, Robt. M., M.D., Old Deer, Mintlaw Station

BANFF.

1895 Robertson, Wm., Grain Merchant, Banff
 1896 Ross, James, Mill of Towie, Keith

FORFAR.

(EASTERN DIVISION.)

- 1895 Davidson, William, Aldbar, Brechin—
Free Life Member
1895 Samson, James, Balmlylo, Montrose

- 1895 Samson, Jas., jun., Balmlylo, Montrose
1895 Young, James, Fordhouse, Montrose

KINCARDINESHIRE.

- 1895 Brown, Alex. G., Assistant Factor,
Durrus Estate Office Aberdeen

6.—DUMFRIES DISTRICT.

DUMFRIES.

- 1895 Adamson, Robert, W.S., Irish Street,
Dumfries
1895 Anderson, Walter, Hazelbank, Beattock
1895 Armstrong, John, Palmerston House,
Dumfries
1895 Austin, James, Kilblain, Caerlaverock,
Dumfriesshire
1895 Austin, Robt., Ladyland, Kirkbean,
Dumfries
1895 Baird, Capt. R. Bruce, of Courance,
Lockerbie
1895 Barber, William, Terreran, Moniaive
1895 Barbour, Gavin, Hazelbrae, Lochmaben
1895 Beattie, John, Baurch, Annan
1895 Bell, Robt., M.D., Penfillan, Thornhill,
Dumfries
1895 Blackley, John, Marchhill, Dumfries
1895 Blair, James Edward, Drumpark Mains,
Dumfries
1895 Blount, John, Fountainblean, Dumfries
1895 Broath, Geo., jun., Smallholm, Lockerbie
1895 Brook, E. J., yr. of Hoddam, Hoddam
Castle, Ecclefechan
1895 Brown, David, Banker, Annan
1895 Brown, J. H. Balfour, of Goldielca,
Dumfries
1895 Brown, Robt., Burnswark, Ecclefechan
1895 Burnie, Arthur J., Carterton, Lockerbie
1895 Burnie, William, Penlaw, Lockerbie
1895 Burns, C., Norwood Cottage, Lockerbie
1895 Callander, Samuel, Clunie, Terregles,
Dumfries
1895 Callander, Gavin, Palmerston Iron
Works, Dumfries
1895 Campbell, John, Knockenjig, Sanquhar
1895 Carruthers, F. J., of Dormont, Lockerbie
1895 Carruthers, William, Balgray Farm,
Lockerbie
1895 Carruthers, Wm. B., Stenrieshill, Moffat
1895 Caven, James, Snade, Auldgrith
1895 Common, John, Cross Dykes, Lockerbie
1895 Copland, Thomas, Seeside, Terregles,
Dumfries
1895 Crawford, Wm., Carruchan, Dumfries
1895 Cumnigug, John, Clothier, Buccleuch
Street, Dumfries
1895 Dalgleish, Robert, Auchentaggart, San-
quhar
1895 Dickie, Joseph, South Cowshaw, Tin-
wald, Lochmaben
1895 Douglas, William, Maryfield, Terregles,
Dumfries
1895 Edgar, James, Annfield, Tinwald, Dum-
fries
1895 Edgar, Joseph, Kilyleoch, Dunscore
1895 Erskine, Robert, Gladenholm, Parkgate,
Dumfries
1895 Ewart, John, Cleuchbrae, Johnstone,
Lockerbie
1895 Ferguson, J. H., Milnhead, Kirkmahoe,
Dumfries
1895 Fraser, T. W. M., Glensone, Southwick,
Dumfries
1895 French, John, Glenmenna, Penpont
1895 Fulton, Arch., Tinwald House, Tortlor-
wald, Dumfries

- 1895 Gass, Thomas, Howgillside, Kirkpatrick-
Fleming, Ecclefechan
1895 Gibson, Richard, Bogge, Penpont
1895 Glover, Baillie Joseph J., Hazelwood,
Maxwelltown, Dumfries
1895 Gordon, H. S., Solicitor, Dumfries
1895 Gourlay, Francis, N. M., Twomerkland,
Moniaive
1895 Graham, William, Hallhills, Lockerbie
1895 Grierson, John, Town Clerk, Dumfries
1895 Grossart, Robert F., M.R.C.V.S., Corrie-
hill, Lockerbie
1895 Haddow, Thos. R., Merkland, Penpont
1895 Hamilton, James, yr., Cample Bridge,
Thornhill
1895 Hatterslay, Neil, Dalswinton, Dumfries
1895 Henderson, Jas., Ryenair, Lochmaben
1895 Henderson, Jas. K., Buttknowe, Kirk-
connel
1895 Holmes, Robert K., Broomrigg, Holy-
wood, Dumfries
1895 Hunter, David, Shearington, Caer-
laverock, Dumfries
1895 Hunter, James, Hardlawbank, Holy-
wood, Dumfriesshire
1895 Hunter, Thomas, Ardoch, Thornhill
1895 Hyslop, Peter, Tregallon, Dumfries
1895 Hyslop, Thomas, Tower, Sanquhar
1895 Hyslop, Wm., Morton Holm, Thornhill
1895 Irvine, Wm., Postmaster, Dumfries
1895 Irving, David A., Cowburn, Lockerbie
1895 Irving, John Bell, Mount Annan, Annan
1895 Irving, Thomas, Grange, Lockerbie
1895 Irving, Thomas, Pearsbyhall, Lockerbie
1895 Irving, Wm., Whitestonhill, Lockerbie
1895 Irving, W. O. Bell, Millbank, Lockerbie
1895 Jackson, James W., Lochhouse, Beattock
1895 Jackson, Thos., Beattock Farm, Beattock
1895 Jameson, Robt., Waterhead, Lockerbie
1895 Jardine, David, Jardine, of Applegarth,
Lockerbie
1895 Jardine, Robert, Corsua, Lockerbie
1895 Jardine, Sir William, of Applegarth,
Bart., Dumfries
1895 Johnston, Archibald F. Campbell, Carn-
salloch, Dumfries
1895 Johnston, John, Kirkhill, Beattock
1895 Johnston, Rev. John A., Dryfesdale
Manse, Lockerbie
1895 Joynson, Francis, Murraythwaite, Eccle-
fechan
1895 Kirkpatrick, Thomas, Bynholm, Pen-
pont, Dumfriesshire
1895 Larg, James, Keltou Grange, Dumfries
1895 Lawrie, C. E., Maxwellton House, Mon-
aive
1895 Lawrie, James, Auction Mart, Dumfries
1895 Lennox, James, Merchant, Dumfries
1895 Lindsay, Jas., V.S., Whitesands, Dumfries
1895 Lindsay, Wm., West Roucan, Dumfries
1895 Little, John B., Sanquhar
1895 Little, William, Renox, Moffat
1895 Lorimer, William, Raedleugh, Moffat
1895 Lyon, J. Stewart, of Kirkmichael,
Dumfries
1895 McCall, William N., Caitloch, Moniaive
1895 McIntosh, John S., Drummuir, Torthor-
wald, Dumfries

1895 M'Millan, John J., Glencrosh, Moniaive
 1895 M'Millan, Robert, Glencrosh, Moniaive
 1895 M'Millan, Thomas, Glencrosh, Moniaive
 1895 M'Murray, Alex., Cathernesheld, Dumfries
 1895 M'Queen, Wm., Broomfield, Sauguhar
 1895 Mackae, D. M., Stenhouse, Thornhill
 1895 Mackie, Andrew, Aitchison Bank, Greta
 1895 Mackie, George, Dornock Mains, Annan
 1895 Mackie, William, Wamphray Gate, Beattock
 1895 Maxwell, M'Kill, Coshogle, Thornhill
 1895 Maxwell, William, Chemical Manufacturer, Bellone, Dumfries
 1895 Maxwell, Wm. H., High Street, Dumfries
 1895 Miller, William, Powmillmount, Kirkbean, Dumfries
 1895 Milligan, Geo. F., Burnmouth, Thornhill
 1895 Milligan, John, Craife Park, Durrisdeer, Dumfries
 1895 Moffat, Francis, Craigbeck, Moffat
 1895 Moffat, Wm. Kennedy, of Shillingland, Sunnyhill, Auldgarth, Dumfries
 1895 Murray, John, Clenghside, Lockerbie
 1895 Murray, William, British Linen Co. Bank, Sauguhar
 1895 Osborne, James, Dinning Farm, Closeburn, Dumfries
 1895 Osselton, Chris., County Sanitary Inspector, Nunholm, Dumfries
 1895 Park, John, Relief, Ecclefechan
 1895 Paterson, John, Fingland, Wamphray, Moffat
 1895 Primrose, Robert, Kirkbog, Thornhill
 1895 Rankin, John S., Waukmill, Thornhill
 1895 Reid, James S., Barr, Sauguhar
 1895 Reid, Walter, Corsebank, Sauguhar
 1895 Richardson, D. B., Haregills, Ecclefechan
 1895 Richardson, James, Cotland, Torthorwald, Dumfries
 1895 Richardson, Wm., Milton, Beattock, N.B.
 1895 Robinson, R., Steam Mills, Annan
 1895 Rogerson, Robert, Seedsman, Dumfries
 1895 Rogerson, Samuel, Boreland, Lockerbie
 1895 Rutherford, Dr James, Crichton Royal Institution, Dumfries
 1895 Rutherford, John, M.P., Summerhill, Annan
 1895 Shortt, Col. W., Fairfield, Dumfries
 1895 Sloan, William, Shawsmuir, Closeburn, Thornhill
 1895 Smith, Geo., Hope Cottage, Rnthwell
 1895 Smith, Matthew, Townhead, Thornhill
 1895 Starke, James Gibson Hamilton, Advocate, of Troqueer Holm, Dumfries
 1895 Steel, Arthur Jackson, of Kirkwood, Lockerbie
 1895 Steel, James, Pennyland, Dalswinton, Dumfries
 1896 Taylor, John, Gateside, Wamphray, Beattock
 1895 Tyre, W. L., Maqueston, Tynron, Dumfries
 1895 Walker, Captain Laurie, Gaarbruck, Thornhill
 1895 Walker, Graham W., Auchencairn, Closeburn, Dumfries
 1895 Waugh, R. B., Shillahill, Lockerbie
 1895 Wightman, Jas., South Mains, Sauguhar
 1895 Williamson, Ninian Alex., of Carzield, Kirkmahoe, Dumfries
 1895 Williamson, Robt., Carse Mains, Auldgarth
 1895 Wilson, Alex., Stakeford, Dumfries
 1895 Wilson, James, 146 High St., Dumfries
 1895 Wilson, John, Newtonards, Holywood, Dumfries
 1895 Wright, Wm., M.R.C.V.S., Thornhill
 1895 Wyllie, James, Grain Merchant, 3 Loreburn Park, Dumfries
 1895 Young, Homer, Redhills, Dumfries
 1896 Young, H. S. M., Carronhill, Thornhill

KIRKCUDBRIGHT.

1895 Hewitt, Hon. William James, Rosebank, Gatehouse, N.B.
 1895 Allan, Robert, Howwell, Kirkcudbright
 1895 Armstrong, John, Culquhan, Ringford, Castle-Douglas
 1895 Barclay, Wm. M'C., Mark, Twynholm, N.B.
 1895 Brown, Robert, Hermitage, Urr, Dalbeattie
 1895 Brown, William, Upper Balannan, Ringford, N.B.
 1895 Callander, Alex., Palmerston Saw Mills, Maxwellton, Dumfries
 1895 Clark, William, Culnain, Crockettford, Dumfries
 1895 Craig, Matthew, Chapmanton, Castle-Douglas
 1895 Douglas, John, Barstably, Castle-Douglas
 1895 Douglas, Thomas, Lochdongan, Castle-Douglas
 1895 Fraser, Hugh, Glaisters, Corsock, Dalbeattie
 1895 Gifford, John, Ingleston, Twynholm, R.S.O., N.B.
 1895 Graham, Robert, Kirkcounel, Ringford, N.B.
 1896 Halliday, William, Halketleaths, Castle-Douglas
 1895 Herries, William D. Y., yr. of Spottes, Dalbeattie
 1895 Lorraine, Dr Walter, Castle-Douglas
 1895 Lusk, Matthew C., Airieland, Castle-Douglas
 1895 M'Cutcheon, Alex., Murrayton, Gatehouse, N.B.
 1895 M'Dowall, John, Girdstangwood, Kirkcudbright
 1895 Neilson, John, of Mollance, Castle-Douglas
 1895 Paton, Robert, Auchencarne, Gatehouse
 1895 Phillips, James, Carse, Kirkcudbright
 1896 Pott, Captain A. D. R., of Todrig, Newton, Dumfries
 1895 Scott, Robert T., Drumhugh, Corsock, Dalbeattie
 1895 Sibbald, William R., Tookatrine, Dalbeattie
 1895 Sproat, Geo. G. B., High Creoch, Gatehouse, N.B.
 1895 Veitch, David Young, Low Creoch, Gatehouse, N.B.
 1895 Walfet, William, Auction Mart, Castle-Douglas
 1895 Welsh, J. Hartley, Enrick, Gatehouse, N.B.

WIGTOWN.

1896 Black, John, British Linen Co. Bank, Wigtown
 1895 Brown, Hugh, Craigland Mains, Kirkcowan
 1895 Caldwell, Hugh, Culhorn Parks, Stranraer
 1895 Campbell, Henry A., Penninghame House, Newton-Stewart
 1895 Crawford, Archibald, Broughton Mains, Sorbie
 1895 Crawford, John, Kilbreen, Stoneykirk
 1895 Douglas, John, Balke, Castle Kennedy
 1895 French, John M., Larg, Newton-Stewart
 1895 Hewetson, John, Baltersan, Newton-Stewart
 1895 Hewetson, Robert, Baltersan, Newton-Stewart
 1895 Hunter, Stephen, jr., Whiteleys, Stranraer

- | | |
|--|---|
| 1895 Hutchison, John, Low Drummure, Kirkmaiden | 1895 M'Dowall, W. R. O. D. Young, Craig Lodge, Glenluce |
| 1895 Kirkpatrick, Joseph, Buchan, Newton-Stewart | 1895 M'Gill, John, Grange of Cree, Newton-Stewart |
| 1895 M'Caig, James M'Meehan, Barnaloch, Lochans, Suranraer | 1895 M'Millan, James, Falgown, Newton-Stewart |
| 1895 M'Conchie, John, Mains of Penninghame, Newton-Stewart | 1895 M'Naught, Robt. A., Dalry, Galloway |
| 1895 M'Culloch, William A., Cardrain, Kirkmaiden | 1895 Morrison, David, Boreland, Kirkcowan |
| | 1895 Morrison, C. Wm., Derry, Kirkcowan |
| | 1895 Ross, Samuel M., Torhousekie, Wigtown |

7.—INVERNESS DISTRICT.

ELGIN.

- 1895 Brown, James Paterson, Innesmill, Urquhart, Elgin
 1895 Fraser, Alexander, Earnside, Alves, Forres—*Free Life Member*
 1896 M'Gowan, Robert, Springfield, Elgin

INVERNESS.

- 1896 Cunmning, William A., Allanfearn, Culloden, Inverness
 1896 Garden, Norman M'Leod, Gollanfield, Fort-George Station
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I N D E X

TO

THE FIFTH SERIES

OF

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(VOLUMES I. TO VII.)

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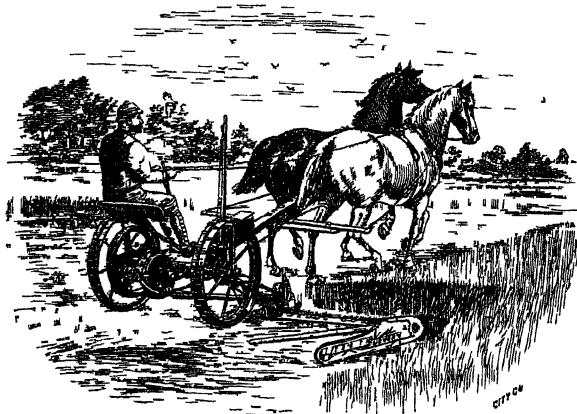
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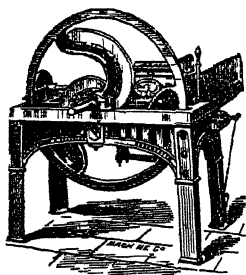
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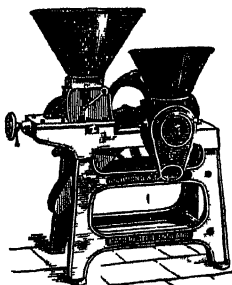


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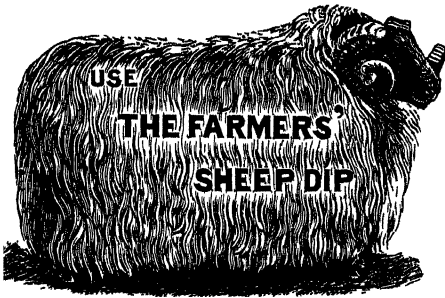
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